

BACKGROUND AND ART OF THE INVENTION

Gas hydrates are found in the gulf of Mexico, in the North see and in other places in the world. However, most of them are either small, impure and blended with other clatrates.

The recent joint venture of Russian, Ukrainian and German geophysicists, geologist and biologist made clear that the best place to look for big and good deposits of Gas Hydrate is the Black See. According to information leaked to the media, by the Russians, the Natural gas, which could be derived from Black see Gas Hydrates, would last for 64,000 years supplying the entire world, if the science and the industry solve the problems of their deep see mining. According to preliminary data there are 20-25 trillion cubic meters of gas.

I, the instant patent applicant VAN MICHAELS CHRISTOPHER am retired geophysicist and American citizen born near the Black See resort town VARNA of Bulgaria. Long time ago I have been involved there in some Black See geophysical prospecting. It is this background of my which motivated me now to develop the hereby claimed deep water technology for electrical prospecting, mapping and mining of gas hydrates through deep water detonations at the very bottoms of the see, caused by underwater short circuits electrical explosions performed by special spark plugs. Such detonations decompose the unstable gas hydrates and release the contained there natural gas as follows:

using a suitable motorized boat equipped with (1) an apparatus for geo-static coordinates determination in open see; (2) a reel on which is winded a long cable joined in pair with a hose of the same length. Theirs other extremities are connected within the inside of a small (frogman's like) bell. Inside the bell is fixed a special spark plug connected with the operator. (3) There is also a portable electric generator connected with the reel (placed in the boat) and the cable, supplying the spark plug with strong electric current; (4) several necessary instruments for monitoring the electrical current. All that instrumentarium is operated by an operator-geophysicist, prospecting for the needed gas hydrates as follows:

he directs the boat upon a straight research profile and stops the boat at equal distances, along the profile, to make measurements ascertaining the coordinates of each sop, to register the debt of the see bottom and to provoke there a powerful electrical explosion -inside the bell- through said spars plug. That is causing a strong detonation which decompose the gas hydrates (if they exists there) and liberate the contained in them natural gas. That gas is collected by the bell and sent to the boat through said hose. The operator analyses the gas, take note about its content and then directs the boat to another

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stop point doing the same testing and notations. When all desired points of the profile are tested, the operator starts testing a new profile and so on. That way is prepared a whole geophysical map documenting the eventually found deposit of Gas Hidrates.

The ELECTRIC MINING of so discovered gas hydrate deposit follows similar technical proceeding of underwater explosions with the difference that must be used a much powerful BEZENTROPIC ELECTRIC GENERATOR, to deliver stronger electric detonations plus much larger bell and industrial see platform for this new kind of underwater mining, liberating 'in situ' the natural gas from said Gas Hydrates. The platform must have also sufficient accommodations for long term living of the working people there.

The so obtained natural gas is then pipelined to the see shore -by polyethylene made pipes (resistant to see water corrosion)- to convert the gas to eco fuels by an unit of the chemical plant producing SAFETY HYDROGEN and by another unit ACETAL FUELS

The manufacturing of the SAFETY HYDROGEN FUEL follows the general steps: natural gas is piped first to the combustion chamber of the BEZENTROPIC POWER PLANT. There the heat (released by the combustion) is converted practically in full into electricity. How the turbine of the bezentropic power plant is achieved that is explained later in this disclosure.

Since the combustion is supported by air, the turbine exhausts a mixture of nitrogen, CO₂ and steam. That mixture is then bubbled in a water thank to be cooled and remove the steam then, is directed to another thank full up with ETHANOL AMINES and bubbled there to absorb the carbon dioxide. That way is obtained and stored pure by produced NITROGEN. Then, by heating the ethanol amines, the absorbed CO₂ is released and separately stored. After that, through the inexpensive electricity from the Bezentropic Power Plant and the ELECTROLYSIS UNIT of the plant is produced sufficient quantity of hydrogen plus by produced oxygen, from water. The so obtained hydrogen is blended with 60% to 96% NITROGEN and is obtain -several grades- of SAFETY HYDROGEN FUEL good for cars using hydrogen, for industrial and for home heating, without danger from accidental explosions. Such inexpensive hydrogen may well change the very infra structure of the industrial chemistry for good, BECAUSE, WHEN IS BLENDED WITH SAID INEXPENSIVE, BY PRODUCED CO₂, THAT YIELDS PERFECT SYNTHESIS GAS WITHOUT NEED FOR COAL without the POLLUTING COAL GASIFIERS and without POLLUTION. As is known the synthesis gas is the bread and the butter of the Industrial Chemistry since it allows to produce other basic chemical substances such as METHANOL, AMMONIA, FERTILIZERS, PLASTICS, SYNTHETIC RUBBER, HYDROCARBONS AND SO ON. On the other hand, since about 70% of the air pollution is produced by the cars and another 20% by the industry, it is obvious that

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when one day all transportation vehicles, the industry, the thermal power plants and the home heating switch to the claimed SAFTY HYDROGEN, which is FREE OF ANY CANCEROGENS, THE ENTIRE WORLD WOULD GET THE SAME CRYSTAL CLEAR AIR, AS THAT OF THE BIBLICAL TIMES.

MOREOVER, only the Gas Hydrates of BLACK SEE can do that for tens of thousand years. Hence, even if on day the claimed process for safety hydrogen would over produce carbon dioxide, it can be conveniently pumped in the deep water of the Black See where it would combine with other substances there and will precipitate as sediments or as carbon dioxide type of CLATRATES witout harm to the plankton and the fish.

ACETALS BASED ECO FUELS FROM GAS HYDRATES AND FUEL ALLOYS

My other ECO FUELS having ZERO CANCEROGENS are ACETALS BASED FUELS which are synthesized from the same Gas Hydrates and from my FUEL ALLOYS. Theirs advantage is that they can be used in today's cars and trucks without any mechanical changes upon them. Related to that it should be noted that now there are only in the United States more than 250 million transportation vehicles and agricultural tractors; and probably more than one billion worldwide. To replace all of them by hydrogen using vehicle is not realistic at least till next half of this century. For the time being a more realistic solution is together with the development of hydrogen using vehicles to start manufacturing ACETAL FUELS as intermediary solution. The manufacturing of ACETAL FUELS can expand much faster with less investments. On the other hand since they do not contain CARCINOGENS, do not need any antiknocks - for them self are the best antiknocks- and practically are pollution free, (except for exhausting CO₂, but, in less amount than the gasoline, the Diesel fuel and the boiler fuel) they are perfect intermediary non polluting fuels till the coming era of the hydrogen fuels.

MOREOVER, the Bezentropic heat engines of this invention can use both claimed eco fuels, as well as the existing polluting fuels -without any design changes- and exhaust 3 to 4 times less CARBON DIOXIDE sine they are 4 times more efficient that today's car engines. Apart to that they could be less expensive.

Using them would allow the entire world to switch smoothly, without financial stress to the hydrogen fuel era since they can replace any ^{Present} heat engine. There is unique medical, ecological and financial advantages from abandonment of all today's pollutant cars and fuels also because;

as is well known to the chemists and to some ecologists, all cyclic hydrocarbons

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are dangerous CANCEROGENS, ^{contained} ~~represented~~ by 42% to 45% ⁱⁿ the gasoline and even more in the boiler and the diesel fuels. In addition to that many countries in the world are still adding to the gasoline ^{the} dangerous cancer inducing and water polluting antiknocks such as the BTE (Butyl Tertiary Ether) and the lead alkyls. About that tragedy should be known that in 1920 (when the gasoline production in the United State has been less than that of the kerosine (then used mainly for illuminating purpose) the CANCER in the United States (and in the world) has been on 16 place as cause for death. Now it ^{take} the second place, after the death caused by the heart attacks. All that was caused by the volatile alkyl lead compounds and the cyclic hydrocarbons, which, during the last half of the 20th century polluted the entire soil and atmosphere on the earth.

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MOREOVER, around all refineries of the world the cancer illness is 4 to 4.5 times higher than today's average, not the average of 1920. These facts are well known to the owners of the refineries and to the ecologists but, they all stay silent about them because, they do not have the solution nor are able to forecast it.

My above mentioned process for manufacturing Acetal fuels, from Gas Hydrates, is CATALYTIC PARTIAL OXIDATION OF THE NATURAL GAS, OBTAINED BY THE ABOVE DISCLOSED UNDERWATER ELECTRIC MINING OF THE GAS HYDRATES. IT WORKS as follows: See fig 1 (a)

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the natural gas-derived from the Gas Hydrates-is mixed with insufficient quantity of said by produced oxygen and then, is inputted into ^{the} continuous tubular chemical reactor A to be submitted there, ^{for} only in tenths of the second, to fast catalytic partial oxidation yielding a flow of intermediary synthesis blend of ALDEHYDES, ALCOHOLS and some KETONS (of little importance). The main aldehyde there is the FORMALDEHYDE followed by the ACETALDEHYDE and the small quantity of Ketones is almost exclusively the ACETONE.

The alcohols are represented mainly by the METHANOL, followed (in smaller amount) by the ETHANOL and the BUTANOL. The used catalyst ¹ is 99.99% pure electrolytic copper in the form of sponge or coils of wire. The temperature of the reaction must be $450^{\circ}\text{C} \pm 20^{\circ}$. The allowable pressure is one atmosphere to no more than 40 atmospheres. Since the reaction is exothermal, the inside of the tubular reactor must be cooled down to the needed temperature by water passing through ^{the} serpentine ² maid up (like the catalyst) of 99.99 pure electrolytic copper.

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The so obtained bouquet of aldehydes and alcohols is then passed into a second continuous tubular reactor B, using another catalyst ³ where it is cooled down to 60°C , sprinkled with about 10% water, and that way is converted to the final FUEL BOUQUET of ACETALS with boiling temperatures from 43°C to 150°C . In order to have summer and

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winter acetal fuels, as winter fuel is first distilled the light fraction, boiling between 43°C and 89°C, while the remaining acetals boiling between 90°C and 150°C represent the summer fuel. When no separation is performed that is a acetal fuel good both for winter and summer. There is no need for more separations of the different acetals because, the 'bouquet of acetals' is better performing. The catalyst in the second reactor represents a plurality of strongly acidic ion exchange resins and natural, or synthetic, zeolites having at least 5 Angstroms pore size, all are doped by ions of calcium chloride.

Notice that the catalytic partial oxidation synthesis is producing more aldehydes than are necessary to produce the bouquet of acetals. Because of that, the extra aldehydes are then passed into a third continuous tubular reactor containing a third catalyst to convert them into light gasoline which is not containing the cyclic hydrocarbons; consisting mainly of isopentane and hexane. Said third catalyst is the synthetic zeolite ZSM-5 having a suitable -for the purpose- pore size of 5.5 Angstroms. It is the same one used by the known MOBIL OIL PROCESS (for direct synthesis of light gasoline from the METHANOL, plus burdensome by produced synthetic water making that process expensive). My just described process for direct synthesis of gasoline is from ALDEHYDES and is more cost efficient for it is avoiding the methanol and uses inexpensive by produced aldehydes, directly produced from the natural gas. Moreover, this direct synthesis of gasoline does not need refining and is not containing cancerogenes. When blended with the acetal fuels it adds to them extra calories. Since the extra aldehydes of the synthesis come together with some unreacted natural gas and with small amount of CO₂, before using them that mixture is first scrubbed with water to dissolve there the aldehydes, then, passed through the ZSM-5 catalyst to produce the gasoline. The remained blend (of unreacted natural gas and CO₂) is passed through ETHANOL AMINES to dissolve there the CO₂. The so purified natural gas is back returned to the first reactor for a new cycle of acetals synthesis. After that, the ethanol amines are heated to liberate the absorbed CO₂ and blend it with hydrogen to produce again the above described synthesis gas or, in the alternative, to send it to the bottom of the sea if more synthesis gas is not needed.

The acetal fuels can be produced with same success also from other hydrocarbons, and from the gas constituent derived from my FUEL ALLOYS (described in my American patents No 4,107,282 and No 4,110,082). The liquid constituent obtained from same Fuel Alloy represents light gasoline not containing cyclic hydrocarbons, suitable to be directly blended with the acetal fuels in order to increase their calories. The needed -for the fabrication of the Fuel alloys- Iron and manganese does not represent supply burden nor

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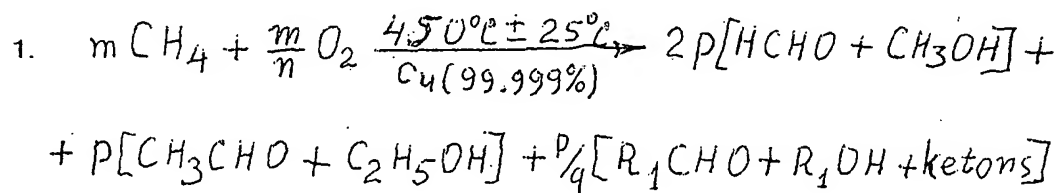
financial burden because, they can be many times recycled for reuse.

When is needed the constituent water in the acetal fuels is removed by distilling them using reverse cooling tube filled up with RASHIG RINGS (condensing and returning the water vapor back to the evaporator. The so purified acetal steam is then, cooled down to liquid acetal fuel).

In the above synthesis

THE INVOLVED CHEMICAL FORMULAE AND REACTIONS

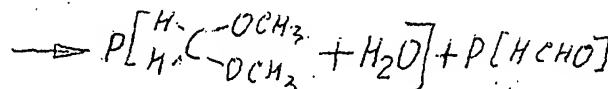
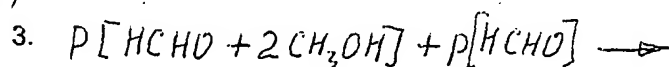
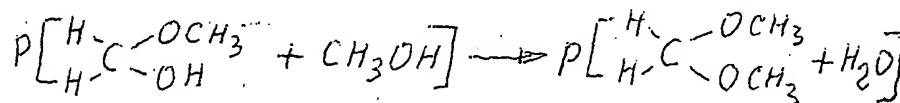
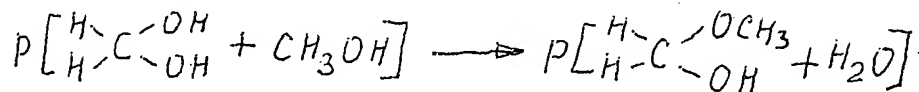
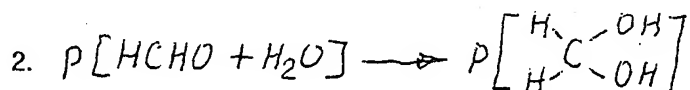
of the catalytic partial oxidation of the natural gas, yielding the intermediary aldehydes, alcohols and ketones are:



This reactions can be performed with any other hydrocarbons -even with crud oil.

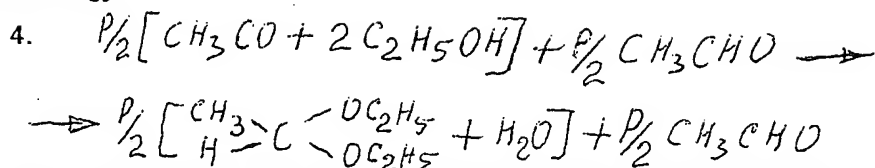
However, producing the acetal fuels from crude oil could be more expensive, since that involve the burden to eliminate the cyclic hydrocarbons and the dioxine formed by burning of the higher hydrocarbons.

The catalytic conversion of the intermediary products to acetals by reaction 1 requires sprinkling ^{the} aldehydes with small amount of water to start the reaction because, the dry formaldehyde does not react with dry alcohols. The so started reaction yields first hemi (half) acetals and then acetals as follows:

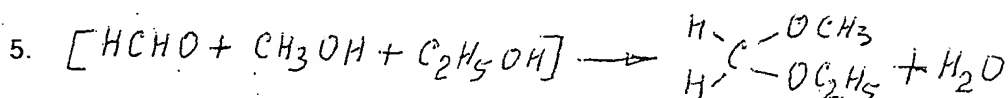


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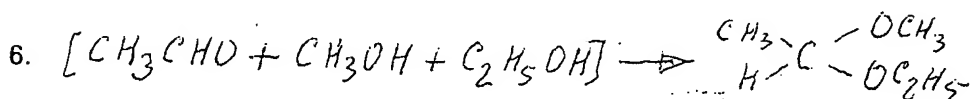
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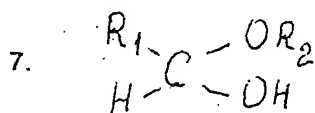
Part of the above reactions yield also mixed acetals as follow:



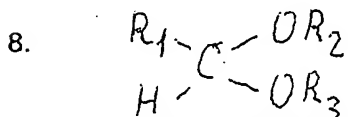
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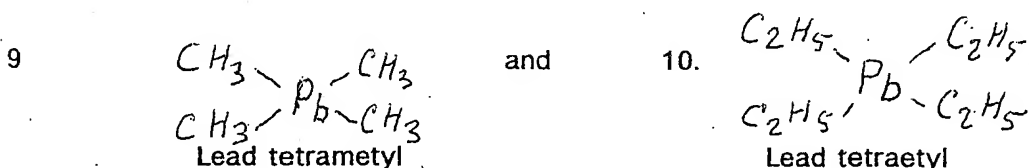
In the above conditions it becomes clear that the generalized HEMI ACETALS' formula is



and that the generalized ACETALS' formula is



I arrived to the idea of acetal fuels as follows: originally I was looking for new antiknocks of high octane number to replace the alkyl lead antiknocks in the gasoline since they are poisonous and carcinogenous. First I examined their structural formulae:



and properties. Examining them, I concluded that their high octane number is not actually due to lead's nucleus but, rather to lead's four valence electrons, bounding there the four alkyl radicals. To check the validity of that hypothesis I decided to replace the lead atom with another 4 atom having also 4 valence electrons, and the alkyl radicals with other 4 monovalent radicals in order to see whether the new 4 valence electrons of the so obtained new compound are capable to deliver octane number as high as that of the alkyl lead compounds. Notably that way the theoretical chemistry led me to the structural formulae of the HEMI ACETALS and to the ACETALS.

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For my surprise the experimental testing displayed that the octane numbers of all acetals surpass that of the alkyl lead compounds and is between 123 and 150.8, while for the alkyl lead compounds it is 114. My laboratory and road testing showed that the acetals are not only the best antiknocks for gasoline but, are also excellent -non polluting and zero carcinogens containing- engine and heating fuels on their own. When to such fuel is added 5% to 8% water it is converted also the first fuel in the world cooling the engines internally and yielding up to 15% more mileage. The extra mileage comes from converting more heat into work.

THE DISCOVERY OF THE BEZENTROPIC THERMODYNAMICS on which are based the pivotal hyper efficient bezentropic devises, Power Plant, processes, cooling and heathing

The main laws on which are based the Bezentropic thermodynamics are: (1) the law of energy conservation and (2) the Law of the Bezentropy -termed also the Low of Order in the universe and ~~also~~ ^{the} SECOND LAW of the BEZENTROPIC THERMODYNAMICS. The role played by law of Bezentropy in the Bezentropic Thermodynamics is similar to that of the SECOND LAW OF THE CLASSIC (and QUANTUM) THERMODYNAMICS. The Bezentropic Thermodynamics also have its QUANTUM version. This invention is concerned with the non quantum version of the bezentropy.

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The ENTROPY as inferred by the method of Clausius

To better understand the BEZENTROPY let's first refresh the reader about the ENTROPY. The law of entropy has been introduced in 1841/43 by the German mathematician RUDOLPH CLAUSIUS (1822-1888). Clausius' full prove is out ^{of} our scope but, in general he deducted it as follows:

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he first noticed that since the efficiency η of the engine of Carnot depends only from the beginning and the final temperatures (of its thermodynamic cycle) the heat Q imputed in that engine cannot be correct measure for heat to work conversion because, in such conditions one and same quantity of heath Q would produce different quantities of work depending on how high and how low are said temperatures. Because of that Clausius started to look for another, more representative unit of said conversion. To do that, he based his method on a FIRST and a SECOND THEOREMS, presently known as theorems of CARNOT-CLAUSIUS. The first of them states:

(1) "The efficiency η of the reversible cycle of Carnot does not depend on the nature of the working body (gas or steam) of the engine and is depending only on the

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temperatures of its heater and cooler".

The second theorem of Carnot- Clausius used by Clausius states:

(2) "When are given two different temperatures it is impossible to construct between them a thermodynamic cycle allowing higher efficiency than that of the cycle of Carnot".

To deduct the law of entropy, Clausius used also two more staring arguments. The one of them is:

(3). The notion (introduced by himself) of the INFINITESIMAL REDUCED QUANTITY OF HEAT "B", reduced by the absolute temperature T , or

11. $B = \Delta Q/T$, which is not the total heat inputted in the GEDANKEN engine of Carnot, but, the heat portion which is actually converted to work by the working body, following an isothermal process of conversion at constant temperature T . Evidently, since $T > 0$, the B has always same sign as that of ΔQ .

(4) The fourth starting argument, of his, is the efficiency formula η of the cycle of Carnot, from where he actually derived the B , noticing that B is actually contained in η . He derived B from there and used it to deduct the ENTROPY as follows:

It is known to the mathematicians and to the physicists that to input or, output, finite Reduced Quantities of Heat B upon any isothermal process (for example to the uper and the lower isotherms of the cycle of Cornot) one must subdivide the isothermal process into infinitesimal sections by intersections with infinitesimal adiabatic processes (creating that way infinitesimal cycles of Carnot along said isothermes) which allows to perform the operation

12. $B = \Delta Q_1/T_1 + \Delta Q_2/T_2 + \dots + \dots = \sum \Delta Q_i/T_i = \int dQ/T$ and that the surface of the cycle of Carnot (indicating the efficiency η) can be calculated as an INTEGRAL of such infinitesimal cycles.

Of course Clausius noticed that the above reduced quantity of heat B actually figures (in a hidden way) in the very efficiency formula of the cycle of Carnot, seen as follows

$$13. \eta = AL/Q = (Q - |Q_0|)/Q = (T - T_0)/T = 1 - |Q_0|/Q = 1 - |T_0|/T \text{ which yields}$$

$$14. Q/T = |Q_0|/T_0, \text{ from wher is obtained}$$

15. $Q/T - |Q_0|/T_0 = 0$; and because the outputted heat $|Q_0| = -Q_0$, one is finally obtaining

$$16. Q/T + Q_0/T_0 = 0 \quad \text{or} \quad 17. \sum Q/T = 0$$

The last expression means that *the algebraic sum of all reduced quantities of heat B inputted and outputted in the working body of the cycle of Carnot is equal to zero.*

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This property is same also for all reversible cycles since any such cycle could be subdivided into infinitesimal cycles of Carnot; and when they are integrated is obtained essentially the same above result as follows:

19. $\sum \Delta Q_i / T_i + \sum \Delta Q_o = 0$ from where are obtained the integrals

20. $\int dQ/T + \int Q_o/T_o = 0$ or, abbreviated

21. $\oint dQ/T = 0$ named INTEGRAL of CLAUSIUS for any reversible process.

Such subdivision and integration is necessary because the geometric form of the surface of the cycle of Carnot (on which depends its efficiency η) is not a circle or ellipse to be calculate by simple formulae. Clausius proved also that the above INTEGRAL (named after his name) when used for IRREVERSIBLE CYCLE yields:

22. $\oint dQ/T < 0$, meaning that for an arbitrary irreversible cycle said integral is always less than zero. In these conditions the Generalized Integral of Clausius for both reversible and irreversible thermodynamic cycles is:

23. $\oint dQ/T \leq 0$

The final inference of the ENTROPY proceeds from the INTEGRAL of CLAUSIUS applied to the reversible cycle of Carnot as simple as follows:

since the above integral 21 is equal to zero taken upon arbitrary closed up perimeter, the differential of its REDUCED (by the T) QUANTITY OF HEAT dQ/T must be a TOTAL DIFFERENTIAL dS of some thermodynamic state function where for any of its states must have a determined (constant) value, leading to

24. $dQ/T = dS$; since dQ alone is partial differential of the heat, then, according to the theory of the Partial Differential Equations, the absolute temperature T plays the role in 24 as INTEGRATING DIVISOR converting the partial differential equation dS into a TOTAL DIFFERENTIAL EQUATION. The differential equation 24 determines therefore, the new THERMODYNAMIC STATE FUNCTION

25. $S = \oint dQ/T$ named by Clausius ENTROPY and meaning FUNCTION OF THE HEAT TO WORK CONVERSION. There, the adequate unit for proportional measuring of the WORK obtained from the originally inputted heat Q is not the heat Q , but, its REDUCED QUANTITY OF HEAT $B = dQ/T$ of CLAUSIUS. In the mean time, that unit B is the total differential of the STATE FUNCTION S (the ENTROPY), which explains both the mathematical and the physical meaning of the entropy as STATE FUNCTION OF THE CONVERSION..

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It should be noted also that the LAW OF ENTROPY has been severely criticized till the First World War -by noted physicists and mathematicians. Thus, 19th century's greatest mathematician KARL-FRIDRICH GAUS never accepted it till the end of his life. MAX PLANK (1858-1947) accepted it only after himself found a better prove, not involving the cycle of Carnot. LUDWIG BOLTZMANN accepted it but, only as a STATISTICAL LAW of the DISORDER IN THE UNIVERSE valid only for very large number of molecules in a given volume. Using the statistical mechanic of BOLTZMANN, M. SMOLYHOWSKI proved (about 1915) that the Law of entropy is not at all valid for micro volumes of gas molecules and so on.

During (and after) the Second World War probably the only bold critic of the Entropy was myself. That allowed me to discover THE LAW OF THE BEZENTROPY as follows:

I accepted the law of entropy as a fact limiting the efficiency of all present heat engines submitted ^{to} all present HEATH ENGINES and as a LAW of the DISORDER creating the atmosphere but, NEVER AS UNIVERSAL LAW, DENYING THE ORDER IN THE UNIVERSE.

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I never accepted also the very proves of Clausius on ground of his GNOSEOLOGICAL ERROR. Thus, according to the Gnoseology (also known as THEORETICAL LOGIC) a logical inference (deduction) must use as STARTING argument(s) only AXIOM(S). The theoretical physicist are more lenient about that matter and when they cannot found suitable axioms sometime use, instead of them, POSTULATES and even HYPOTHESIZES but, believe them only when they are experimentally supported. Differently from the POSTULATES which may look strange and inexplicable but are deducted through many experiments by independent experimenters, an AXIOM is always 'a priori' evident true, clear for everyone in the world, including by children -not knowing yet to read- for which such evident true (named axiom) does not need proving to be understood.

EXAMPLE 1: if a working mom is asking her boy on the telephone: "Boby is the light bulb in your room off?" Boby would say "Yes mom it is off" if it is really off and "No mom" if it is on. Only that much obvious evidence qualify as AXIOM.

Contrary to that, a POSTULATE is never 'a priori' clear (even by scientists) but, is accepted in lieu of needed axiom (when suitable axiom cannot be found) accepted only after numerous experiments supporting the postulate; which are repeated many times by many scientists.

EXAMPLE 2: the POSTULATE of Einstein's Special Theory of relativity is not 'a priori' evident for any scientist (including also Einstein) but, ~~it~~ has been accepted as a postulate by all scientist because: years of experiments conducted with the INTERFEROMETER of MICHAELSON and MORLEY proved its validity. However, sometime ^{even} the postulates accepted by all scientists could be RISKY.

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EXAMPLE 3: the fifth postulate of EUCLID stating that 'through a point out of a straight line one can draw only one line parallel to ^{the} straight line' is an error. Some 2000 years after Euclid stated it, the Russian mathematician LOBACHEVSKI found that it is not correct and created the so named NON EUCLIDIAN GEOMETRY. So the postulates are not so sure starting premises for inference. 06-06-03
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My own objection concerning the way by which CLAUSIUS deducted the ENTROPY consist in the controversial use of the GEDANKEN (thought, immaginay) CYCLE and ENGINE of CARNOT because: THEY ARE NOT A AXIOMS, NEITHER POSTULATES SINCE THEY ARE NOT BUILDABLE, HENCE, CAN NEVER BE EXPERIMENTALLY TESTED. They are not even hypotheses since the efficiencies η -of the real heath engines- differs ENORMOUSLY from η calculated by the cycle of Carnot. To justify a hypothesis as 'true' said difference must be less than 1% while in the case with the real heat engine said difference is often more than 50%.

CONSEQUENTLY, not agreeing with the prove of Clausius, conserning the gnoceological part of its work, and knowing that, after Clausius, other noted scientists attempted proving the ENTROPY, in a better way, I decided to carefully review them. That way I concluded that: the precise way of proving the entropy are the statistical way of BOLTZMANN and of MAX PLANK.

BOLTZMANN showed that the ENTROPY is not ABSOLUTE but, just a statistical law valid only for macro volumes of gases containing extremely large numbers of molecules in disorder. Then, he stated that the LAW OF ENTROPY is actually the LAW OF DISORDER IN THE UNIVERSE. Notably from that DISORDER I discovered how to liberate the INTERNAL KINETIC ENERGY of each molecule ENCAPSULATED in its own MICRO BUBBLE of its own MEN FREE PATH. That discovery of my is further described in this paten disclosure. 06-06-03
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THE METHOD OF MAX PLANK

The other best prove of the ENTROPY is that of MAX PLANK (from where I actually got the first HINT about the existence of the LAW OF THE BEZENTROPY). His prove is irreproachable since is not using the GEDANKEN (thought, imaginary, not feasible) cycle and ENGINE of CARNOT, nor the cycle of any real heat engine. Instead of them M. Plank used the theory of the PARTIAL DIFFERENTIAL EQUATIONS and a simple buildable apparatus giving him a hint only how to find out an INTEGRATING DIVISOR to convert the PARTIAL DIFFERENTIAL EQUATION of the HEAT ENERGY moving the ENGINES into a TOTAL DIFFERENTIAL EQUATION in order to integrate the work produced there by every molecule of the working body; and thus, to deduct the LAW OF ENTROPY from the very ENERGY CONSERVATION LAW there. Notwithstanding that his apparatus is buildable it is not

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necessary to build it because, it is used only as a hint (to find out the INTEGRATING DIVISOR without the cycle of Carnot). His method is therefore pure mathematical. The theory of the integrating divisors has been developed before Max Plank but, there is no general rule of how to find them. Hence, a mathematician must use its own INTUITION for that following the path of trials and errors. Said apparatus therefore, could be GEDANKEN as well and that is still not causing gnoseological problem.

The conversion of said PARTIAL to TOTAL DIFFERENTIAL EQUATION is needed to allow said INTEGRATION for otherwise no partial differential equation can be integrated.

The Energy integration is needed also since no one is interested in converting the heath into work of one only molecule. Life need conversion of heat to work of tons of molecules.

UNFORTUNATELY, the ^{energy} differentials of the heath inputted in any of today's heath engines are partial, not of total differentials. Therefore, to convert the heath into work of each molecule and then to integrate these minute works into sizable quantity, one first must find an INTEGRATING DIVISOR ^{for} conversion of said PARTIAL DIFFERENTIAL EQUATIONS of the heath into ARTIFICIAL TOTAL DIFFERENTIALS in order to proceed with the desired integration.

Evidently, any heat engine is doing that mechanically. Therefore, all heath engines are MECHANICAL DEVICES FOR INTEGRATING PARTIAL DIFFERENTIAL EQUATIONS. That mechanical integrating must have its MATHEMATICAL EXPRESSION and it is needed to find out, from there, the LAW OF ENTROPY since a law is not mechanical part and cannot be seen from the engines. Obviously such reasoning lead MAX PLANK to mathematically deduct the LAW of ENTROPY from the ENERGY CONSERVATION LAW, THE PARTIAL DIFFERENTIALS and the INTEGRATING DIVISORS as follows.

The energy conservation law (governing any heath engines) has the following mathematical expression:

$$26. \quad dQ = dU + A.Pdv \quad \text{where: } Q = \text{heath in Kcal, } P = \text{pressure, } v = \text{volume}$$

$P.dv =$ differential work in Jowls (or in Kg.m) and $A =$ heat equivalent of the work.

Obviously, in 26 the elementary work $L = P.dv$ is partial differential (for it contains 2 variables P and v). The total differential of a product of 2 variables $d(P.v)$ is

$$27. \quad d(P.v) = Pdv + vdP, \text{ not only } P.dv$$

In 26 the elementary INTERNAL Energy dU of the working body is total differential (for it contains only 1 variable). However, when to a total differential equation is added a partial differential it is converted to PARTIAL DIFFERENTIAL EQUATION and CANNOT BE INTEGRATED. Hence, it must be back converted to total differential to be integrated.

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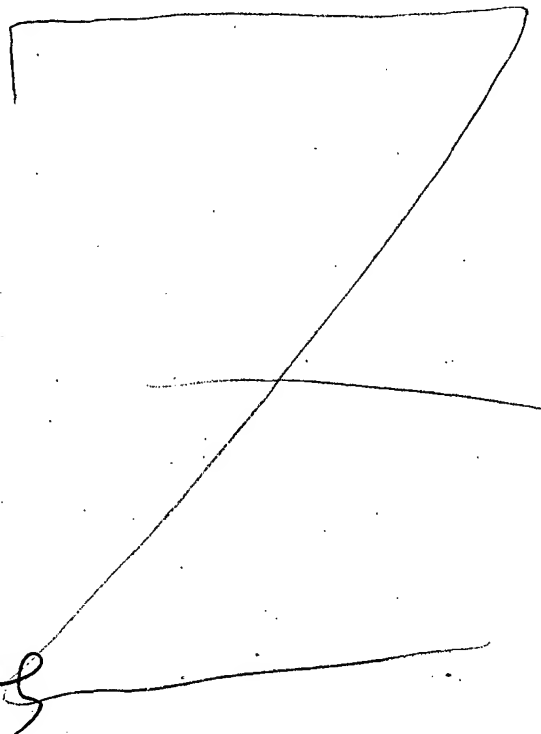
That is not always easy because there is no universal rule for such conversion. Fortunately, for many cases that can be performed using the Theory of the INTEGRATING DIVISORS. Such divisor is a special number N , or a function $N(x,y)$ of variables, which when used to divide a Partial Differential Equation converts it, to an (ARTIFICIAL) TOTAL DIFFERENTIAL EQUATION, which can be integrated. That way the Partial Differential Equation 26 is converted to the total

$$28. \quad dS = (dU + A.Pdv)/N(v,t)$$

The new trouble is that (notwithstanding that there are many integrating divisors) THERE IS NO GENERAL THEORY of FINDING THEM and ONE MUST GUESS FOR THEM. Max PLANK solved that guessing by designing the buildable apparatus of Fig.1(b) which guided him. It consists of 2 well insulated calorimeters separated by the removable insulator C. Each of them has own cylinder and piston movable by own weights G_A and G_B suspended by ropes and exchangeable cams; and filled up with gases A and B. The purpose of the apparatus is to provide a hint about the needed INTEGRATING DIVISOR by modeling the energy equation

29. $dS_1 = dU_1 + A.P_1dV_1 = dU_2 + A.P_2dV_2 = dS_2$; where U_1 , U_2 and P_1 , P_2 are functions respectively of the v_1 ; v_2 and the common temperature t . The common temperature t of the 2 separated calorimeters is established by adiabatic compressions and depressions using the pistons (and their cams for perfect adiabates). The performed work is measured by said weights. From equation 28 and the (specific for each dS) Integrating Divisors N_1 and N_2 one can deduct also the equation:

$$30. \quad N_1.dS_1 + N_2.dS_2 = 0$$



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where dS_1 and dS_2 are the STATE FUNCTIONS of the 2 working (gas) bodies which for given integrating divisors are defined (up to an integrating constant) by the used pressure P and the temperature t . According to the theory of the integrating divisors there are many such divisors N_i all expressed by the equation

$$31 \quad N_i = N(V, t) \cdot f(S); \text{ where } f(S) \text{ is arbitrary function of } S.$$

The consequence from that is that the value of the function S (termed ENTROPY) is unitary defined only when the arbitrary function $f(s)$ is established. By its indefinite character it is not different from that encountered in the experimental scales of the temperature; and that is a good hint that the integrating divisor could be the absolute temperature. Let's now perform a calculation by an arbitrary (indefinite) integrating divisor N respecting the condition $N > 0$.

Equation 28 imply that the reversible adiabates

32 $dU + A \cdot PdV = 0$ are lines of constant entropy, where each specific adiabat may be identified by own specific value of S , if one choose an initial (arbitrary) adiabat prescribing it a given (arbitrary) initial value S_0 .

In these conditions the veracity of equation 29 is established as follows:

Evidently, initially the thermodynamic STATES of said 2 gases A and B is determined by the independent variables V_1, t_1 and V_2, t_2 , where initially is assumed that the temperature t is measure by whatsoever temperature scale. Since A and B are inserted into well insulated calorimeters separated each from the other by the insulator C, both gases can change their states in reversible manner, if the eventual work performed there is used only to elevate or step down said 2 weights G_A and G_B where to respect the mechanical equilibrium the used cams are changeable according to the requirements of the thermodynamic processes. In this conditions of full adiabatic insulation of A and B each of them can change its state only following an adiabatic process. Moreover, because the adiabatic temperature insulation does not allow input or output of heat from outside, when for the heat energy of each gas A and B is chosen a given INTEGRATING DIVISOR such as $N_1(V_1, t_1)$ and $N_2(V_2, t_2)$ for each gas the function S take constant values S_1 and S_2 . Of course they could be well changed to other values but, only as follows:

(1) through adiabatic changes both gases (initially insulated from each other) are brought to one and same temperature t . After that,

(2) the insulator C is removed. However, on account of the different pressures inside of A and B (created by the used different weights G_A and G_B to arrive at the common temperature t) the gas under the higher pressure would stimulate reversible isothermal input of heat dQ into the other gas. Evidently at such process one of the 2

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gases is receiving exactly the quantity of heat which the other gas is losing. Namely that reversible heat exchange, at common temperature t , allows the equilibrium of equation 29 which we were looking to prove.

Evidently, 29 and 30 form a system of 2 equations, allowing free choice of the 3 variables, one of which (the temperature t) is common parameter. Because of that if we bring one of the 2 gases to a state V_1, t the state of the other gas V_2, t becomes unitary determined and vice versa. On the other hand since any adiabatic process is conducted without heat exchange with the environment, when one of the 2 gases assume an initial entropy S_1 , the other takes always a corresponding initial entropy S_2 and vice versa; and this is without regard at what temperature occurred the variations of their entropies. All this means that whenever one of the 2 gases, occupying any state, is back returned to its initial entropy, its state go back to its initial adiabat. Because of that interdependence, one can always reintroduce the insulator C , to again insulate the 2 calorimeters one from the other, and after that to return, say the gas A, reversibly and adiabatically, to its initial state (V_1, t) . In this conditions the other gas would go back to its initial adiabat S_2 and upon that adiabat one also can return it also to its initial thermodynamic state (V_2, t) . Since the process is reversible, the thermodynamic state to the gas B must go back to its initial adiabat corresponding to its initial entropy S_2 . Upon that adiabat one can also return the gas B to its initial state (V_2, t_2) .

Naturally if is supposed that that the second gas cannot go back to its initial adiabat, then, one can always return it, by reversible adiabatic process, to its initial temperature t_2 and after that, to propel it through the ISOTHERM t_2 back to its initial thermodynamic state (V_2, t_2) . Upon that ISOTHERM is either inputted or, outputted heat. Accordingly, if there is inputted heat it should be converted to work, when the gas is returned to its initial state. However, this means that the gas is returned back to its initial amount of energy and still its entire inputted heat energy was converted to work. That according to the second law of the classic thermodynamics is impossible. If on the other hand there is output of heat, it should be obtained from work since returning the gas to its initial state of energy means that its INTERNAL ENERGY U WAS NOT CHANGED. Such thermal process however is NOT REVERSIBLE and that contradicts the initial assumption that it is reversible.

This way one arrives at the conclusion that at any reversible thermal exchanges between 2 working bodies (gases) to each given value of the entropy of one of the gases it strictly corresponds a value of the entropy to the other involved gas; and that is fully independently at what temperature said exchange is occurring.

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Consequently, if in equation 29 the independent state parameters V_1 , V_2 and t are exchanged with the independent parameters S_1 , S_2 and t , the temperature t gets eliminated and in such a case one obtains a thermodynamic expression only between S_1 and S_2 of the kind:

$$33. \quad F(S_1, S_2) = 0$$

When equation 33 is differentiated is obtained

$$34. \quad (\delta F / \delta S_1) \delta S_1 + (\delta F / \delta S_2) \delta S_2 = 0 \quad \text{then, it is concluded} \quad 06-06-03$$

that to establish equivalence between equation 34 and the similar equation 30 one should perform the operation

35. $dS_2/dS_1 = - (\delta F / \delta S_1) / (\delta F / \delta S_2) = - N_1/N_2$ meaning that N_1/N_2 depends only from S_1 and S_2 and not from the temperature. That is because, as above displayed, said function F does not depend on the temperature. On the other hand the INTEGRATING DIVISOR N_1 is function of only S_1 and t and N_2 is function of only S_2 and t . Consequently N_1 and N_2 must be of the kind:

36. $N_1 = f_1(S).T$ and $N_2 = f_2(S).T$; where T could be only function of the temperature t since T must be CANCELED by dividing. MOREOVER, because the functions $f_1(S)$ and $f_2(S)$ are well arbitrary, they could be equal also to 1. HOWEVER, in such a case that yields the following common INTEGRATING DIVISOR:

37. $N_1 = N_2 = T$ which is not anymore dependent on said 2 parameters. It is now a function $T = T(t)$ of the empiric temperature t , and that is the ABSOLUTE TEMPERATURE. There the unknown factor $T(t) = 0$ (the absolute temperature) ^{is determined} by the known method using the freezing and the boiling points of the water. Taking into account that about the INTEGRATING DIVISOR PROVED TO BE $N = T$ the partial differential equation of the first law (governing the energy conservation of the heat inputted into any heat engine) is converted by the T to an ARTIFICIAL TOTAL DIFFERENTIAL

38. $dS = (dU + A.PdV)/T$ allowing to proceed with the needed integration.

THE ADVENT OF THE BEZENTROPIC THERMODYNAMICS

INTRODUCTION

The Bezentropic thermodynamics were discovered and developed by myself. That was looking to update my 'Doctorat ès science physique' thesis published by the University of Paris in 1965 under the title: THÉORIE NATURELLE DE LA SUBSTANCE (Dépôt légal. IIIe trimestre 1965, Bibliothèque Nationale, Paris; donné à l'imprimeur le 20-03-65).

I got the FIRST HINT about an imperative NEED for said new thermodynamics much

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earlier (back in 1947-48 as university student) while examining the GNOCEOLOGICAL PROBLEMS associated with the method of Rudolph CLAUSIUS (1822-1888) by which he inferred, in 1842/43, the LAW OF ENTROPY known also as THE LAW OF DISORDER IN THE UNIVERSE. Clausius deducted it from the GEDANKEN (thoughtful, imaginary, not feasible) CYCLE and ENGINE OF SIDI CARNOT.

At that time I did not have a chance to discover it. However, said very tempting hint did not left me for years and made me the only critic of the entropy after World War II. Finally I discovered the searched for years pivotal law and named it THE LAW OF BEZENTROPY.

The delayed discovery forced me to stay pretty silent in my 'Théorie Naturelle de la Substance' even about the classic thermodynamics. Being never interested in making EPHEMERAL THEORIES, neither in theories lacking practical applications, I further stayed silent till fully developing the basics of the Bezentropic Thermodynamics and finding out practical applications from them.

That way the word Bezentropy appeared for first time in my biography published on page 706, of Marquis' "WHO'S WHO IN THE WEST" book of 1989-90 where it was misspelled as "Benzentropy". The same misspelling appeared also in my biography published on page 1124 of Marquis' "WHO'S WHO IN THE WORLD" book of 1991-92. After that, I wrote 2 ABSTRACTS about the BEZENTROPIC THERMODYNAMICS which appeared in 1997 Proceeding of the SOUTHWESTERN and ROCKY MOUNTAIN DIVISION of the AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (AAAS) (where I had also an oral presentation) and then, in the 1998 Proceedings of the PACIFIC DIVISION of the AAAS, where I also had an oral presentation. However, neither of them contained the information stating the merits of this patent disclosure.

I coined the word BEZENTROPY after the Bulgarian word "BEZ" (meaning WITHOUT) and the classic scientific word "ENTROPY" to reflect, in a best short way, the scientific meaning of the BEZENTROPIC THERMODYNAMICS.

The main laws governing the Bezentropic thermodynamics are:

- (1) the (known) universal LAW of ENERGY and MATTER CONSERVATION;
- (2) The new LAW OF THE BEZENTROPY, creating the ORDER in the universe and DEFYING the efficiency limit η on the heath to work conversion proclaimed by the Cycle of Carnot.
- (3) the special set of heath to work conversion formulae expressed only by NATURAL TOTAL DIFFERENTIAL EQUATIONS invoking the 3 (three) dimensional THERMO MECHANICAL PROCESSES and CYCLES, of the BEZENTROPIC THERMODYNAMICS.

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NOTE: as above averred, the differential of the ENTROPY is ^{TOTAL}ARTIFICIAL ⁰⁶⁻⁰⁶⁻⁰³NOT ^{revised}NATURAL DIFFERENTIAL OF THE HEATH (obtained from the partial differential equation 26 divided by the integrating divisor T^0K). It is this important detail separating all phenomena of the ENTROPY from these of the BEZENTROPY, were the notion of ENTROPY is synonym DISORDER, while the BEZENTROPY is synonym of ORDER in the universe.

Other important elements contributing of the Bezentropic Thermodynamics are

- (4,a) heath to potential energy conversion;
- (4,b) heath to linear kinetic energy conversion;
- (4,c) heath to circular kinetic energy conversion and
- (4,d) heath to electric energy conversion.

All of these important new conversions are prompted, stimulated and governed by a PLURALITY of BEZENTROPIC DEVICES, COMPRESSORS, ENGINES, HEATH PUMPS, VORTEX TUBES and by the following supplemental laws and theorem:

(5) the spontaneous evaporation, at any temperature and time, of all evaporable liquid;

(6) the reversible EVAPORATION-CONDENSATION PROCESS;

(7) the law of PASCAL;

(8) The law of ARCHIMEDES

(9) The THEOREM OF BERNOULLI (1700-1782) stating: "at any point inside a tube where there is flowing a fluid, the sum of the energy, of the pressure, the potential energy and the kinetic energy is a constant" and ⁰⁶⁻⁰⁶⁻⁰³

(10) the FIRST and the SECOND laws of Bernoulli concerning the fluids (explained further in this disclosure. Item 1 to 10 together with the 3 dimensional BEZENTROPIC THERMO MECHANICAL PROCESSES and CYCLES are creating the infra structure of the BEZENTROPIC TECHNOLOGY.

When quantum processes are involved the Bezentropic thermodynamics become also QUANTUM. That way the law of bezentropy governs both the molecular and the nuclear realities, exists simultaneously with, but, independently from the entropy.

The specifics of the discovery on which is based the invention

Examining the methods of Max Plank and Rudolph Clausius I noticed that neither of them, nor anyone else to present, paid attention to the fact that *MOTHER NATURE DEFIES the LAW OF ENTROPY, on many occasions, by following another UNIVERSAL LAW which I termed THE LAW OF BEZENTROPY* and that they both are existing independently one from the other. The best examples displaying said DEFIANCE are the following PARADOXES:

PARADOX No 1

von Linz

The second law of the thermodynamics has several definitions and one of them is: "the heat flows spontaneously (on its own) only from a point of higher temperature down to a point of lower temperature" thus, creating a heat flow following the direction of the temperature gradient. When there is no such gradient no heat flow exists nor classic heat engines can work for *engine's* purpose is to convert the heat into work. This is evident also from the very efficiency formula of the cycle of Carnot (from where Clausius derived the Entropy) reading

$$39 \quad \eta = (T_2 - T_1)/T_2; \text{ Evidently when } T_2 - T_1 = 0 \text{ then also } \eta = 0$$

Looking at this formula one day I was surprised by noticing that it is prohibiting my own existence and that of all humans and other living being because: none of us has whatsoever temperature difference at the cellular level of our muscles where (inside of their MITOCHONDRIA) the chemical energy of the food is converted to heat and then to work and to bioelectricity. Since there is no temperature difference at our cells the ENTROPY is PROHIBITING OUR EXISTENCE. ISN'T IT TERRIBLE? Hopfully, some 400 years ago the French mathematician and philosopher, René DESCARTES, proclaimed: "COGITO ERGO SUM" (I think, therefore I exist). Who is then right? Clausius or, Descartes?.

Evidently, the simultaneous existence of people and classic heat engines is clearly telling that beside the ENTROPY and the ENERGY CONSERVATION LAW, there must exist also another universal thermodynamical law defying the entropy and permitting the existence of all living beings. - They all are biological kind of heat engines. Fate favored me to discover that law and named it BEZENTROPY.

PARADOX No 2

According to the entropy it is impossible to convert in full the heat into work or, into mechanical energy. Such conversion must respect the efficiency limit of formula 39 requiring to exhaust most of the heat ^{is} not used, simply as a permit for engine's periodical work. Indeed however, this prescription of the entropy is duly DEFIED by the (more than one century old) NOZZLE OF LAVAL which is converting the heat into linear kinetic energy by 99% efficiency.

PARADOX No 3

MOTHER NATURE DEFIES THE ENTROPY also when creating the clouds, the rain and the waterfalls because: she elevates the vapor from the oceans and the crust up to the clouds again without temperature gradient, within each short subinterval of vapor's elevation. More details of these 3 paradoxes are given further in this disclosure

A major neglect of the classic thermodynamics is that they missed to realize that all classic heat engines are actually MECHANICAL INTEGRATORS ^(but) of only PARTIAL

van Lier

DIFFERENTIAL of the HEATH, and more importantly: since some differentials of the heath
^{NATURAL} are TOTAL DIFFERENTIALS (like the ENTALPY for example) NOTHING IS PRECLUDING THE
SCIENCE TO LOOK FOR MECHANICAL INTEGRATORS OF ^{NATURAL} TOTAL DIFFERENTIALS OF THE
HEATH. MOREOVER, SINCE A TOTAL DIFFERENTIAL IS (mathematically) INTEGRATED
DIRECTLY, NOT INVOLVING THE REDUCED QUANTITY OF HEAT $B = dQ/T$, THAT IS
PROMISING FULL HEATH TO WORK CONVERSION. MOTHER NATURE ACTS IN SIMILAR WAY
WHILE CREATING THE CLOUDS, THE RAIN, THE WATER FALLS, ALL LIVING BEINGS, THE
IRRIGATION OF OUR PLANET AND SO ON.

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HENCE, should we learn how to copy Mother Nature we may design even better than
here Bezentropic engines and would forget the ENTROPY for HEAT TO WORK CONVERSION.

The calculus is teaching that THE INTEGRATION OF ANY NATURAL TOTAL
DIFFERENTIAL EQUATIONS is always performed DIRECTLY, WITHOUT ANY INTEGRATING
DIVISORS (as these used by Max Plank) or, by the REDUCED QUANTITY OF HEAT (of
Clausius).

Evidently, Max Plank introduced his INTEGRATING DIVISORS $N_1 = T$ for a limited
purpose: to obtain the REDUCED QUANTITY OF HEATH 'B' of Clausius without the
GEDANKEN CYCLE of CARNOT. That removes one of the following 2 GNOSEOLOGICAL
objections concerning the method of Clausius. The FIRST of them is the inadmissible use of
a GEDANKEN PREMISE in mathematical, as well as, in logical deductions; and the SECOND is:
the equally inadmissible replacement of the starting premise (the heath $Q = J$) by new
premise (the reduced quantity of heath $B = Q/T$ of Clausius), for that changes the subject of the REDUCTION.

The LAW OF THE BEZENTROPY used by Mother Nature is avoiding both
gnoseological errors of Clausius (perpetuated by the worldwide acceptance of the
ENTROPY together with its defects). Otherwise the entropy also exists and it is the creator
of the ATMOSPHER.

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FULL HEATH TO WORK CONVERSION IS POSSIBLE ONLY BY FOLLOWING THE LAW OF
THE BEZENTROPY. IT IS SHOWING US HOW TO BUILD ENGINES CAPABLE TO INTEGRATE ^{and}
THE TOTAL DIFFERENTIALS OF THE MOLECULAR ENERGY OF THE STEAM AND GASES.

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^{Conserved} THE ENTALPY AND THE INTERNAL ENERGY ARE ALWAYS FORM OF NATURAL TOTAL
DIFFERENTIAL EQUATIONS, not needing the REDUCED QUANTITY OF HEAT 'B' of Clausius to
perform the INTEGRATION. Notice ^{also} that the B is always smaller than the original heath Q
inputted in the engine. The Q must be divided by the temperature T to obtain the B... All
that -stated in the language of the mathematics- means that to have full conversion of the
heath into work, WE MUST INPUT IN THE ENGINES ONLY NATURAL TOTAL DIFFERENTIAL OF
THE HEAT and MUST REFORM THE CLASSIC HEAT ENGINES TO MAKE THEM CAPABLE TO

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PROCESS SUCH KIND OF HEATH. NOW ANY CLASSIC HEATH ENGINES CAN INTEGRATE ONLY PARTIAL DIFFERENTIALS OF THE HEATH. *My* task can be performed only by the herein claimed BEZENTROPIC ENGINES. The REDUCED QUANTITY OF HEAT (named by Clausius also ENTROPY) is not ORIGINAL, IT IS SECONDARY TOTAL DIFFERENTIAL, obtained artificially, through dividing the originl Q by the absolute temperature T. Namely that diminishment of the Q -mandated by the ENTROPY- is PREDETERMINING the POOR EFFICIENCY OF ALL CLASSIC HEATH ENGINES. The ROOTS of that bad feature resides in the DISORDERED COLLISIONS of the gas (or steam) molecules. To avoid the predistinated ENTROPIC LOSSES of the classic engines is needed to understand all details of the eternal bubbles created by the MEAN FREE PATH of the gases and learn from there; how to convert their ENERGY of ^{MOLECULAR} DISORDER into ENERGY of ^{MOLECULAR} ORDER, WHICH ^{would} MAKES THEM CONVERTIBLE, WITHOUT, LOSSES, TO: POTENTIAL ENERGY, LINEAR KINETIC ENERGY, CIRCULAR KINETIC ENERGY and to ELECTRICITY. Only that way the energy of the disordered gas and steam molecule can be HARNESSSED (by direct integration) into ^{efficient} macro quantity of energy. Let's then see how all that is working.

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The mathematical expression of the energy conservation law used by Max Plank to deduct (from there) the ENTROPY was equation 26 reads

$$dQ = dU + A.Pdv$$

As already said, it is a Partial Differential Equation since is containing a differential of 2 variables (P and v) but, is missing the expression A.vdP to become total differential. As is known from the calculus the total differential from a product of 2 variables is

$$40. \quad d(P.v) = P.dv + v.dP ; \text{ Consequently,}$$

when one replaces the partial differential of equation 26 by the total differential of 39 the result is

41. $dQ = dU + A(P.dv + v.dP) = dJ$; which is exactly the TOTAL DIFFERENTIAL of the HEATH CONTENT of the working body, termed also ENTALPY, given by

42. $J = u + A(P.v)$; which, when is differentiated, yields the partial differential equation $dJ = dU + A.(Pdv + v.dP)$, referred to 1 kg working body. For G Kilograms it is:

$$43. \quad J = U + AG(P.V) \text{ and } dJ = dU + A.G(PdV + VdP)$$

The original heat content of a gas (or steam) is its ENTALPY J, and not the heat Q of equation 26. However, notwithstanding that fact the engine is using the Q of 26 and not the J. Let's see why is that discrepancy -shown by 26 and 41. That is raising the question:

WHY ALL CLASSIC HEATH ENGINES ARE WORKING BY USING THE REDUCED QUANTITY OF HEATH B (termed ENTROPY) instead by the more beneficial FULL HEATH CONTENT J (given by 41) REPRESENTING A NATURAL TOTAL DIFFERENTIAL? Mathematically such TOTAL

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DIFFERENTIAL NEEDS NOTHING ELSE TO BE CONVERTED TO WORK !

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IN VIEW OF ^{THE} EXISTING NATURAL TOTAL DIFFERENTIALS OF THE HEAT, EVIDENTLY, WE NEED FULLY NEW HEATH ENGINES CAPABLE TO CONVERT AND INTEGRATE DIRECTLY THE HEATH ENERGY (OF THE WORKING BODY) TO WORK; SINCE NO CLASSIC ENGINE CAN DO THAT. THEY ALL ARE MECHANICAL INTEGRATORS OF ONLY PARTIAL DIFFERENTIALS OF THE HEATH. THIS IS THE PROBLEM WITH THE CLASSIC ENGINES.

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To understand that puzzle let's first analyze only the nature of the INTERNAL ENERGY U (U IS TOTAL DIFFERENTIAL) and see how U can be used to generate the ENTALPY and reshape the classic engines into Bzentropic Engines..

ACTUALLY According to the KINETIC THEORY OF THE GASES the INTERNAL ENERGY of a gas IS ^{CAPABLE} KINETIC ENERGY OF THE MOLECULES; BUT, NOT ^{CAPABLE} PERFORM WORK WITHOUT VOLUME EXPANSION. There $T^{\circ}K$ is always proportional to the *hidden mean kinetic energy* of the *disordered molecular movement* given by equation

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44. $a.T = mW^2/2 = 3/2.kT = U$; where 'a' is coefficient of proportionality equal to the mean kinetic energy of the gas molecules at $T = 1^{\circ}K$; and is same for all gases ($a = idem$) while $k = 2/3.a$ is the well known constant of Boltzmann and $U = Q = J$ meaning INTERNAL ENERGY U at constant gas volume.

Strictly speaking, formula 44 is correct only for ideal gases and also for real gases having very low liquefying temperature and pressure (such as the hydrogen, the helium or, even the atmospheric air for example). In such conditions they comport them self as super preheated gases even at $t^{\circ} = 0^{\circ}C$. For such gases their molecules may be regarded even as maid by one atom, having only 3 degrees of freedom (since the rotary energy of such molecule is so negligent that is allowing to assume theirs molecules as points without rotation).

For more real gases having 2 molecules theirs degrees of freedom are 5 (the 2 more are due to their rotations around theirs center of gravity). The gases having molecules of 3 atoms (like the CO_2 for example) have 6 degrees of freedom since to their basic 3 degrees of freedom are added 3 more from energy of rotations. The molecules having more than 3 atoms are assumed having also 6 degrees of freedom because, theirs movements are reduced down to 6 by way of theirs natural sub groupings.

MAX WELL and BOLTZMANN created the kinetic theory of the gases assuming that the INTERNAL ENERGY U of the gases is subdivided equally to the degrees of freedom of their molecules; assigning, to each freedom of theirs, the kinetic energy $E_k = 1/2kT$. Then, for 1 mol gas, having Z degrees of MOLECULAR FREEDOM, its INTERNAL ENERGY U_{μ} is:

45. $u_{\mu} = \mu u = A.N_{\mu}Z^{1/2}kT$; however, $kN_{\mu} = R_{\mu} = 848$ and then, formyla 45 becomes

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46. $u_{\mu} = 1/427.848.1/2.Z.T = 0.99255 Z.T$ (Kcal./Mol) ; consequently,

46(a) for gas of 1 atom molecules the INTERNAL ENERGY $u_{\mu} = 0.99255. 3T = 2.775.T \approx 3.T$

46(b)of 2 atoms molecules $u_{\mu} = 0.99255. 5T = 4.9625.T \approx 5.T$

46(c)of 3 or more molecules $u_{\mu} = 0.99255. 6T = 5.9550.T \approx 6.T$

It should be noted that when a steam is preheated it comports itself well like a gas.

The pressure P of a working gas (having 1 atom molecules) which exercises upon the walls of engine's cylinder (or, upon the walls of any other container) is

47 $P = 2/3.n_M.m.W^2/2$; where n_M is the concentration of the molecules (equal to the number of the molecules inside of 1 M^3 gas); m = mass of the gas molecule and W^2 = to the geometric mean of the molecular velocity. Formula 47 is displaying that the pressure P is equal to $2/3$ from the kinetic energy of the molecules enclosed in a container of volume = 1. The average velocity W_a defined from 47 is

48 $W_a = (W^2)^{1/2} = [3P/n_M.m]^{1/2}$; since $n_M.m$ is the mass of the molecules in volume $V = 1$ we can have also

49 $n_M m = \gamma/g$; then, from 48 and 49 is obtained

50 $W_a = [3Pg/\gamma]^{1/2}$. That way from 50 can be easily calculated the average molecular velocity of the ideal working body. For the atmospheric air at $0^\circ C$ and pressure of 1 atm = 1,0332 kg/cm²; $g = 9,81$ m and $\gamma_{0,760} = 1,293$ kg/m³ it is

51 $W_a = [3.1,0332.9,81/1,293]^{1/2} = 485$ (m/sec) = 1,746 klm/hour

This is a tremendous supersonic velocity for a freezing temperature of $0^\circ C$. At room temperature the velocity specter of air's molecules (calculated for first time by James Maxwell) expand from 100 m/sec to 1000 m/sec; and the majority of them are doing that between 200 m/sec. and 800 m/sec. (again at atmospheric pressure). In a heat engine however, the combustion process is raising the temperature t to more than $1000^\circ C$ and the pressure P to about 40 atmospheres. At such conditions the average velocity of the gas molecules go up several thousand m/sec. Should the atmosphere had that velocities probably the earth would have lost its atmosphere for it would escape the gravity. Example of that is the situation with the sun. Regardless of its enormous gravity, it still ejects a lot of hydrogen in the space.

The supersonic velocities of each gas molecules creates enormous INTERNAL kinetic energy but, completely locked up and isolated inside of own tiny microscopic BUBBLES of VELOCITY FIELD. Each bubble like field represent an elastic volume of the disordered reshuffling of the molecule enclosed there by its own MEAN FREE PATH. As further disclosed the only way to profit from that enclosed energy is adequate usage of the TOTAL DIFFERENTIAL EQUATION 60 or (less favorably) the partial differential equation 29.

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The mean diameter of these BUBBLES OF FIELD is equal to the MEAN FREE PATH of the gas molecules there. SAID TINY BUBBLES lock (like the locked nuclear energy but, in this case performed by mechanical forces) THE ENTIRE INTERNAL ENERGY U OF ANY GAS (OR, STEAM). TO LEARN HOW TO UNLOCK THAT ENERGY LET'S FIRST SEE HOW said BUBBLES are CREATED.

According to the LAW OF PASCAL the Pressure P of any gas or steam put inside a closed container (or in engine cylinder) presses the walls of the container in all directions -by equal forces acting at right angles (regardless of the shape of the container).

However, following the LAW OF ACTION AND COUNTER ACTION, SAME PRESSURE P CREATES, INSTANTLY, BACKWARD FORCES EQUAL TO AND OPPOSING THE P. THESE BACKWARD FORCES ARE PRESSING -FROM ALL DIRECTION- ALSO UPON EVERY INDIVIDUAL MOLECULE OF THE GAS THUS, CREATING A BALANCE OF FORCES BETWEEN THEM AND THE FORCES OF THE MUTUAL MOLECULAR REPULSION, ^{thus} RESULTING IN THE CREATION OF A CLOSED UP-BUBBLE LIKE-VELOCITY FIELD AROUND EACH MOLECULE. 06-06-03 v. 2.0

EVIDENTLY, THAT IS AN ELASTIC BALANCE TANTAMOUNTING TO A BARRIER OF ELASTIC MICRO BALOONE KEEPING INSIDE THE KINETIC ENERGY OF THE MOLECULE. The internal energy of any gas or steam represents namely such captured energy.

Since the applied forces and energy balance are same for all molecules, EVIDENTLY, AT UNIFORM PRESSURE AND TEMPERATURE ALL BUBBLES MUST HAVE ONE AND SAME MEAN FREE PATH AND THEREFORE, ONE AND SAME DIAMETERS AND VOLUMES.

An interesting result from this theory of the micro bubbles is that at long last it explains, the centuries old, ENIGMA concerning AMADEO AVOGADRO'S (1776-1856) LAW STATING: "equal volumes of different gases but, submitted to equal pressure and temperature contain always equal number of molecules". That Law has been validated by very diligent experiments but, to present don't have clear cut logical explanation. The theory of the molecular bubbles now explains that enigma as follows:

since the sizes of all gas molecules are in the order of 10^{-8} sm. but, theirs uniform mean free paths (identical with the uniform diameters of said bubbles) -depending on the corresponding pressure- could be easy in the interval of 10^{-4} sm to 1 mm, it follows that WHAT IS RELEVANT FOR AVOGADRO'S LAW are not the volumes of the ATOMS but, only the volumes of theirs micro bubbles (since are millions times larger than the atoms) and all equal in volume because are created by balance of equal forces. CONSEQUENTLY, at equal volumes and pressure all gases would create equal numbers of micro bubbles and therefore, must contain equal numbers of molecules, which explain the ENIGMA of Avogadro's Law since as displayed, the number of the gas molecules is always equal to the

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number of theirs micro bubbles. Moreover, because the degrees of freedom Z are easily recognizable from the chemical formulae of each gas they are not causing any problem.

FINALLY, by way of reciprocity, the experimentally established Law of Avogadro is direct confirmation of the very existence of the micro bubbles.

WHILE NUMERICALLY CORRECT, the kinetic theory of the gases needs the following UPDATING: according to that theory, all gas molecules exist in FULL DISORDER OF MUTUAL COLLISIONS. HOWEVER, THAT ASSUMPTION IS NOT FULLY CORRECT.

Indeed full disorder does not exist at all in the world... Best proof for that are the existence of the FUNDAMENTAL GAS EQUATION

52. $P.V = R.T$; the Avogadro's Law and all other laws governing the gases. They all are signaling for a LIMITED ORDER IN THE MOLECULAR DISORDER of ALL GASES and STEAMS. Should there be an ABSOLUTE DISORDER then, none of said gas equations could exist because, an absolute disorder cannot tolerate any law. Such absolute disorder would be like a self-defeating "CONSTITUTION of ABSOLUTE ANARCHY" consisting of only 2 articles, the first of which proclaiming: "ESTABLISHED IS HEREBY FROM NOW ON, THE LAW OF THE ABSOLUTE ANARCHY and the second "reinforcing" the first proclaims: "SINCE WE ARE ABSOLUTE ANARCHY, NO ONE IS OBLIGED, FORCED OR COERCED TO OBEY ARTICLE ONE"

CONSEQUENTLY, it is the existing 'limited order in the disorder' of the gases which keep intact the micro bubbles, at any pressure and temperature and keep inside of them the INTERNAL KINETIC ENERGY of the gases and the steam.

Once again, the mathematical expression of the FIRST LAW used by Max Planck as starting PREMISE, to deduct from there the Law of Entropy, is equation 26 containing the partial differential $A.Pdv$, which making 26

$$dQ = du + A.Pdv \quad \text{a partial differential equation.}$$

The differential of the internal energy du there is said kinetic energy hidden within the micro bubbles.. Due to the elastic nature of said bubbles, the classic heat engines extract energy from there by periodically expanding and contracting them through outside heat and pressure. When more heat is inputted in the bubbles their kinetic energy increases because, the walls of the micro bubbles are transparent for the photons. These walls-barriers are impermeable only to the neighboring bubbles. The elastic nature of the micro bubbles ALLOWS TO USE THEM, CONVENIENTLY, AS PROMOTERS OF HEAT TO WORK CONVERSION, BOTH BY FOLLOWING THE LAWS OF THE ENTROPY AND OF THE BEZENTROPY.

Following the LESS EFFICIENT PATH of the ENTROPY the bubbles convert the heat

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into work as follows:

The differential volume expansion dV of each bubble prompted by the pressure P pushes each element dF (of the surface F of the bubble) and moves it to a radial distance dS causing the differential volume expansion

53. $dV = \int_F dS \cdot dF$ since the pressure P pushes inside the bubble all elements dF (at the inside surface F of the bubble) pushes there by the force dK equal to $dK = PdF$; that yields the elementary work

54. $dK \cdot dS = P \cdot dF dS$; and upon integrating that yields the larger elementary work from the volume increases:

55. $dL = \int_F P \cdot dF dS = P \int_F dF dS$; then, taking into account 53 is obtained the new result 56. $dL = PdV$; which expressed in calories is:

57. $dL' = A \cdot PdV$; then, upon integrating to obtain the total generated work from the full volume expansion is obtained:

58. $L = A \int_{v_1} v^2 PdV$. Obviously, at $dV = 0$ there is no work performance.

The same result is valid also for the micro bubbles of the steam and for any solid body submitted to uniform pressure upon its entire surface. *MOREOVER* because the Law of Pascal and the Law of the Action and Contraction do not change with the forms of the containers (keeping inside them the gas or the steam) it follows that the spherical shape of the micro bubbles also does not change there. Consequently, equation 57 expressing the integral work obtained from the volume increments (expansion) of the micro bubbles is valid also for *UNILATERAL expansion of the working body inside the cylinders of the reciprocating engines and in the classic gas and steam turbines.*

Accordingly, to deduct the ENTROPY without the cycle of Carnot, Max Pink used rightfully as starting PREMISE the Energy Conservation Law 26 because, 26 is applicable for all classic heat engines and turbines.

Of course while doing that he knew also that equation 26 is only a shortened differential form of the GENERAL ENERGY CONSERVATION AND TRANSFORMATION LAW and that its FULL FORM (regarding the general heat to all other forms of energy transformation) is

59. $Q = U_2 - U_1 + APV + AG(h_2 - h_1) + AG/2g(W_2^2 - W_1^2) + AG\Sigma\Delta E$; where h is the height at which the working body raises upward in the cylinder thus, creating POTENTIAL ENERGY; W = velocity of the gas (or steam) created by the volume expansion in the cylinders and generating some kinetic energy; Q = heat; G (in kg) = to kilograms of used working body; U = internal energy (of G kg working body); APV = work of VOLUME EXPANSION (from G kg); ; g = gravity acceleration of the Earth [in m/sec^2]; $\Sigma\Delta E$ = other

Max Pink

forms of insignificant conversions of the heat (inside the heat engines) such as from (insignificant) ionization of the molecules to ions and partial recombination of said ions back to molecules and

60.. $A = 1/427 \text{ [kcal/kgm]} = 860 \text{ [kcal/KWh]} = 632.3 \text{ [kcal/hp]}$ is the HEATH EQUIVALENT of the MECHANICAL WORK and the RELECTRICITY.

When $G = 1 \text{ kg}$ working body, the variables Q , U , V and E in formula 59 MUST BE CHANGED to q , u , v and e , to refer them to $G = 1$. In these conditions the energy differential of 59 becomes

$$61. dq = du + A(dPdv + vdP) + Adh + Ad(W^2/2g) + Ad(Q^2/2g) + A\Sigma de$$

A missed opportunity to discover the Bezentropy

As said to infer the ENTROPY (without the cycle of Carnot) Max Plank used as starting "axiom", for his inference only part $dq = du + A\rho dv$ of equation 61. Evidently he did that because all experiments show that the total from all other (omitted) parts of 61 are less than 1% from the heat q . CONSEQUENTLY, he chose to SIMPLIFY his mathematical prove. Surprisingly (as hereinafter displayed) namely that simplicity denied him the opportunity to discover the BEZENTROPY.

REVIEWING HIS (OTHERWISE GOOD) METHOD and confronting it with MOTHER NATURE'S METHOD of HEATH TO WORK CONVERSIONS and with the way by which is working (for more than a century) the NOZZLE OF LAVAL, I discovered that the KEY for the desired COMPLETE CONVERSION OF THE HEATH INTO WORK resides namely in the missed (by M. Plank) parts of equation 61. Namely through them I discovered:

(a) the LAW OF THE BEZENTROPY,

(b) the BEZENTROPIC 3 (three) DIMENSIONAL 'THERMO MECHANICAL' PROCESSES AND CYCLES, AND

(c) FROM THERE DEVELOPED THE NEW 'BEZENTROPIC THERMODYNAMICS, ON WHICH IS BASED THIS INVENTION.

Let's then see how they were discovered and how they work:

(I). The ENERGY of any gas -at constant volume- amounts to its INTERNAL KINETIC ENERGY. It is given by equation 44; which for convenience, is reformed into equations 46, 46(a), 46(b) and 46(c).

As said the micro bubbles providing proper room for each molecule are created by the balance between the pressure P of the gas and the backward pressure $-P$. On the other hand the pressure P is created by the temperature T of the gas creating also its internal energy and the bubbles' disordered collisions. Consequently, since T and P are eternal said micro bubbles and the mini order in their disorder are also eternal; and that is the source

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A large, stylized, handwritten letter 'Z' or '7' that spans most of the page, drawn with a thick black line. The letter is oriented vertically, with the top horizontal bar at the top of the page and the bottom horizontal bar at the bottom. The diagonal stroke runs from the top right to the bottom left. The letter is drawn with a thick black line, and there are some small, faint marks around it, possibly from the scanning process.

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DIFFERENTIAL DEFINITIONS OF THE ENTROPY AND THE BEZENTROPY

(a) Common ground of the classic and the bezentropic thermodynamics:

(a₁) The first common ground between the classic and the bezentropic thermodynamics is the fundamental heat equation (formula) 46, describing the internal energies du of all gases. It displays that the internal energy of any gas depends only on the absolute temperature T and its degree of molecular freedom Z . On the other hand equation 43 (from where is derived 46) displays that the internal energy of any gas is actually kinetic energy of the molecules. The integral impulse of that energy creates the pressure P of the gas. Said kinetic energy is enclosed and hidden inside the micro bubbles of each molecule. The round shape of the micro bubbles around each molecule has as diameter the *mean free path* of the molecules and its surface consists of spherical in shape balance between the omnidirectional pressure P of the gas and the backward pressure $-P$ (caused by the law of the action and the counter action acting upon the walls of the gas container, or by the atmospheric pressure when there is no container).

Since each micro bubble is fully transparent to the photons of the heat and the light; hence, because, every molecule is continuously emitting and absorbing photons we feel the internal energy U as heat. Beside that, the temperature causing the ionization, of the gases, is also adding to the internal energy of a gases.

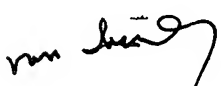
(a₂) All gases are actually over preheated steams. These over preheated steams are obtained at temperatures over the critical temperature -dividing the gases from the ordinarily preheated steams, termed also dry steams.

(a₃) Dry steam is obtained by preheating in the temperature interval between the boiling temperature and the critical temperature of a boiling liquid. Any dry steam behave more or less like a gas.

(a₄) Wet steam is obtained only at the boiling temperature of a liquid. That temperature is constant till the full evaporation of the liquid; and causes the merging and uniting the isothermic process with the isobaric one of the evaporation.

The internal energy of any wet steam (vapor) is equal only to its LATENT HEAT OF VAPORIZATION, while the internal energy of the dry steam equals to the sum of the latent heat of the vaporization plus the heat of the preheating.

(a₅) Increasing or decreasing the temperature T of a gas (or, of preheated steam) is respectively inputting and extracting energy to and from the basic internal energy of a



working body.

(b). The second common ground between the classic and the bezentropic thermodynamics

is the law of the general heat to work, and to other forms of energy conversion, which can be introduced as follows:

(b₁) When in a gas or, steam is inputted a quantity of heat, say dq , in general that causes increase to both of his temperature and volume. The temperature increases theirs INTERNAL ENERGY du and the volume increase converts part of the heat to: WORK, POTENTIAL ENERGY, LINEAR KINETIC ENERGY, CIRCULAR KINETIC ENERGY and other (not so important) energies -in amounts from 0 to a finite value- according to the specific situation. That multiple conversion, of the heat, is expressed by the general differential equation (formyla) 61 reading:

$$dq = du + A(Pdv + vdP) + Adh + Ad(W^2/2g) + Ad(Q^2/2g) + A\sum de$$

It represents an additive series of individual total differential expressions where each of them can be eliminated -when at given physical condition its value becomes close to zero- without harming the direct integrating property of dq because, the remained (shortened) series is still a total differential -not needing any integrating divisor to proceed with the integration, in order to obtain macro quantities of work and/or other forms of energy. Equation 61 is therefore very universal and practical LAW of general energy conversion containing (as below displayed) both the laws of the ENTROPY and the BEZENTROPY. It is therefore, the common ground of the classic and the bezentropic thermodynamics.

(b₂) The heat to work conversion of the classic thermodynamics represents a over shorttening form of the above general energy conservation law 61, given by the PARTIAL DIFFERENTIAL EQUATION 26 reading:

$$dq = du + A Pdv.$$

When needed the Bezentropic Thermodynamics are also using short expressions of the GENERAL ENERGY CONSERVATION LAW 61 but, NEVER the over shortened EQUATION 26. It is a major theoretical error to use equation 26 -for heat to work conversion- nor to use it in combination with other members of the additive series of 61 because: its use is AUTOMATICALLY TRANSFORMING SUCH COMBINATION from TOTAL to PARTIAL DIFFERENTIAL EQUATION. Such transformation is BARRING both the very discovery of the BEZENTROPY and the real possibility for full conversion of the heath to work.

As already proved, any partial differential equation needs an INTEGRATING DIVISOR to be converted to total one, in order to be integrated. The integrating divisor however, is

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reducing the original amount of the heat -intended to be converted to work- down to a miserable reduced quantity of heat B (of Clausius); hence, it is very expensive and HANDCUFFING PARTIAL DIFFERENTIAL EQUATION.

FURTHERMORE, because the CALCULUS allows to integrate only TOTAL DIFFERENTIALS and because any PARTIAL DIFFERENTIAL EQUATION causes REDUCTION of its original amount, on the way of its conversion to total differential -in order to perform the needed integration- one must never use forms of heat yielding partial differential equations for heat to work conversion purpose. Such error is causing enormous losses of heat when one counts on the LAW OF ENTROPY. The only solution to avoid these losses is: switch to the LAW OF THE BEZENTROPY. Confucius says: AVOID CONFUSION TO GET HAPPY

Modifying the law of conversion

(b₃) As said, equation 61 is additive series of total differentials. In accordance with the particular physical situation the members of that series could be positive, negative or zero. For example if the energy conversion following 61 is performed at ADIABATIC CONDITIONS then, $dq = 0$ and we would have:

$$62. A(Pdv + vdP) + Adh + Ad(W^2/2g) + Ad(Q^2/2g) + A\Sigma de = - du$$

Equation 62 displays that in ADIABATIC CONDITIONS the produced work and all other forms of energies become generated only on account of the (diminishing) internal energy u_μ of equation 46. Since that energy is hidden inside of the micro bubbles (kinetic) energy, equation 62 is therefore, telling us how to get it from there for practical use.

(b₄) If the energy conversion of 61 is conducted in condition of ISOCHORIC PROCESS (meaning at constant volume, non adiabatic process) then, at such conditions no heat to work conversions nor heat to other forms of energy conversions are possible for they all require volume expansion. In such conditions equation 61 becomes:

$$63. dq = du = \text{equation}$$

Equation 63 means that at constant volume all inputted heat q in the working body (gas or steam) is converted to INTERNAL ENERGY of the body. Equation 63 is same one for the classic and the bezentropic thermodynamics.

(b₅) When the conversion of the heat is performed at constant internal energy U , its differential du becomes $du = 0$ and in such conditions -termed ISODYNAMIC PROCESS- the total of the heat dq is converted to work and other forms of energy as follows:

$$64. dq = A(Pdv + vdP) + Adh + Ad(W^2/2g) + Ad(Q^2/2g) + A\Sigma de$$

Search for natural and artificial physical integrators

Formula 61-being general law of the energy conversion is capable to generate both

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the classic (entropic) and the bezentropic thermodynamics. That is because from there can be obtained both THE LAW OF ENTROPY and the LAW OF THE BEZENTROPY. What is MOST IMPORTANT in 61 is that it is a TOTAL DIFFERENTIAL EQUATION representing an additive series of simple and independent total differentials expressions allowing any member of the series -at specific circumstance- to be eliminated without harming the ability of the remaining shortened series to stay TOTAL DIFFERENTIAL and to allow DIRECT INTEGRATION and conversions. Another remarkable position there is that: all members of the series - excepting one- are differentials of one only variable. This is precluding them get turned into PARTIAL differential expressions without regard to the physical circumstances. The excepted member of the series is again a total differential but, of 2 variables P and v instead of one and is

$$65. \quad Ad(P,v) = A(Pdv + vdP)$$

representing main part of the classic ENTALPY (the heat content) of the gases or steam

$$66. \quad dj = du + A(Pdv + vdP) \quad \text{transported trough the industrial pipelines.}$$

It is the member 65 of the series 61 and 66 which caused the BIG BLUNDER of the classic thermodynamics (physically and theoretically) which BARRED the discovery of the BEZENTROPY as follows: studying the classic engines the fathers of the classic thermodynamics did not noticed that what is doing the good correspondence between the classic engines and the mathematical expression 66 is the mere fact that they all ARE PHYSICAL INTEGRATORS OF ONLY PARTIAL DIFFERENTIAL EQUATIONS PRECLUDING THE DIRECT INTEGRATION OF THE NATURAL TOTAL DIFFERENTIALS OF THE HEAT. Due to that handcuffing fact when in them is inputted a NATURAL TOTAL DIFFERENTIAL OF THE HEAT, say the ENTALPY:

$dj = du + A(Pdv + vdP)$, the engine immediately eliminates its part $A(vdP)$ by pushing and enclosing it inside the micro bubbles of the molecules, ^{thus} increasing their internal heat energy from du to du' and converting the entalpy from total differential to the partial differential equation of the heath

$$67. \quad dQ = du' + A.Pdv$$

This is an INVISIBLE AUTOMATIC CONVERSION but it is still detectible because, whenever we input in the classic engines the total differential of the entalpy 66 the engine process it like the partial differential equation 67 producing the enormous entropic losses of heat. That heat is lost as followes: as averred by the calculus, a partial differential equation cannot by integrated directly. CONSEQUENTLY, to proceed with the integration, the engine, BEING INTEGRATOR OF SOLELY PARTIAL DIFFERENTIALS, CONVERTS INSTANTANEOUSLY THE ABOVE OBTAINED PARTIAL DIFFERENTIAL 67 TO THE SECONDARY ARTIFICIAL TOTAL

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68. $dB = dS = [du' + PdV]/T$ which is exactly the differential of the REDUCED QUANTITY OF HEATH of Clausius (termed by him ENTROPY), causing AUTOMATICALLY said enormous losses of the heat, exhausted without benefit in the atmosphere just as a penalty permit (imposed by the entropy) allowing the engine to work periodically. NAMELY this intrinsic bad feature of all classic engines and turbines forced all scientist in the world to wrongly believe –for more than 150 years till now– that the LAW OF ENTROPY entropy is the only way for heat to work conversion. This major collective error closed the eyes of all scientist to see *that beside the entropy* there exists also the much more beneficial LAW OF THE BEZENTROPY. It is widely used by Mother Nature. understandably, for some specific purposes she is using also THE LAW OF ENTROPY, for example to create the atmosphere, requiring a disordered movement of its molecules.

The dramatic inability of all classic engines and turbines TO USE DIRECTLY the widely existing NATURAL TOTAL DIFFERENTIALS OF THE HEAT, while Mother Nature is doing that very efficiently, is telling that *our civilization must look for alternative heat engines capable to accept, convert and integrate directly* THE NATURAL TOTAL DIFFERENTIALS OF THE HEATH. SUCH IS THE MAIN PURPOSE OF THIS INVENTION.

Differential definitions of the Entropy and the Bezentropy

Taking into account all above, THE LAW OF ENTROPY can be defined more precisely as follows: "THE ENTROPY IS A WAY FOR PARTIAL HEAT TO WORK CONVERSION, USING FORMS OF HEAT YIELDING ONLY PARTIAL DIFFERENTIALS AND INTEGRATING THEM VIA THE REDUCED QUANTITY OF HEATH. (of Clausius) $B = [du + PdV]/T$ RESULTING IN CONSIDERABLE LOSSES OF HEAT".

Contrary to that, the definition of the Bezentropy reads:

"THE BEZENTROPY IS AN ALTERNATIVE WAY FOR FULL HEAT TO WORK CONVERSION, USING FORMS OF HEATH HAVING NATURAL TOTAL DIFFERENTIALS THEREFORE, INTEGRATING THEM DIRECTLY THUS, AVOIDING THE BURDENSOME 'INTEGRATING DIVISORS' CAUSING THE REDUCED QUANTITY OF HEAT AND THE HEAT LOSSES".

**THE 3 DIMENSIONAL BEZENTROPIC
THERMODYNAMIC PROCESSES**

Being a diligent student of Mother Nature I noticed that she is intensively using the law of bezentropy to create the clouds, the rain, the waterfalls, the entire irrigation of our planet and the creation of all living beings and plants. I noticed also that while defying the entropy she did not abandoned it in full and used it artfully to create the atmosphere for

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benefit of all living beings. All these prompted me to see in more details said natural thermodynamic processes of the bezentropy and try to copy them for more practical purposes. That way were create the bezentropic thermodynamics and the alternative bezentropic engines, compressors, heat pumps and so on.

I tested for that purpose several physical models corresponding to the several mathematical combinations of the general energy transformation law 61 which is also the general energy conservation law of the univers.

The first three-dimensional Besentropic cycle defying the Entropy and converting the heat directly to potential energy

The first 3-dimensional bezentropic cycle is HYDRAULIC THERMO MECHANICAL CYCLE for direct heat to potentialenergy conversion, then to kinetic energy and work conversion.

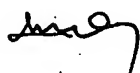
Seeing that there is a lot of *latent heath of vaporization, elevated in the atmosphere up to the clouds spontaneously (on its own) without temperature difference (gradient) at each (and even at each 10) meters of the elevation but, still bringing there billions tons of water causing the rains, the waterfalls the floods and the irrigation of the entire planet,* one day I realized that this is DEFYING THE LAW OF ENTROPY because: according to the Entropy no heat can move spontaneously without temperature gradient. Hence, I studied that process in more details in order to copy it for practical purposes.

Remembering in the mean time Max Plank's integrating divisor T , the reduced quantity B of heat of Clausius and the HANDCUFFING partial differential equation (causing the need for B and T); and also the DRAMATIC physical inability of all classic heat engines to integrate ANY HEAT FORMES HAVING NATURAL TOTAL DIFFERENTIALS I decided to try also novel alternative construction of engines avoiding said handcuffing defect.

Of course, such major revision of the classic engines and thermodynamics must respect the fundamental ENERGY CONSERVATION AND TRANSFORMATION LAW given by equation 61.. Taking into account all above, the problem was resolved the following way:

FIRST LEG OF THE CYCLE

It consists of creating mechanism defying the law of entropy and allowing to move heat without temperature gradient. That mechanism starting with evaporating process 1 to 2 on the 3-dimensional h, P, v Bezentric cycle of **Fig 2** consists in the following: as is well known, the water (and all other evaporating liquids) evaporate(s) at any temperature (the ice even sublimate). On the other hand, nature is evaporating the water always at atmospheric temperature and pressure. The necessary heath for that is taken from the surface of the oceans, the sees, the crust and the air; and they are resupplied with heat

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by the sun. That evaporation is therefore both an isothermic and isobaric process where the involved there heat of vaporization $q_{1,2}$ is equal to

$$69. \quad q_{1,2} = u_2 - u_1 + A.P.(v_2 - v_1) = u'' - u' + A.P.(v'' - v') = r, \text{ where:}$$

r = latent heat of the vaporization; the sign(') denote thermal states (internal energy) of the evaporating water; (") denote thermal state of the obtained vapor; and v'' and v' are the specific volumes of the vapor and the water, respectively.

Since the vaporization proceeds at constant temperature and pressure, its latent heat of the vaporization r is also constant. Then, it follows that the specific volumes of the vapor v'' and of the water v' are also constants.

In such conditions the entalpy of the obtained vapor and that of the water becomes

$j'' = u'' + A.P.v$ and $j' = u' + A.P.v$; on account of which the latent heat of the vaporization r can be expressed also through the entalpy as follows:

70. $r = j'' - j'$; hence, it can be easily calculated, for any atmospheric temperature, from the tables and diagrams of the entalpy, existing since more than a century ago. From there are copied the following data:

at $t = 20^\circ$: $P(\text{kg/cm}^2) = 0.02383$; $v'(\text{m}^3/\text{kg}) = 0.0010018$; $v''(\text{m}^3/\text{kg}) = 57.84$;

$\gamma(\text{kg/m}^3) = 0.01729$; $j'(\text{Kcal/kg}) = 20.03$; $j''(\text{Kcal/kg}) = 606.0$; $r(\text{Kcal/kg}) = 586.0$;

at $t = 100^\circ\text{C}$: $P = 1.0332$; $v' = 0.0010435$; $v'' = 1.673$; $\gamma = 0.5977$; $j' = 100.94$; $j'' = 638.9$

and $r = 538.9$

Since the evaporation and the condensation processes are fully reversible, the absolute value of the heat of the condensation, $-r$, is same as r or: $|-r| = r$.

The major part of j'' and r is concentrated in the internal energy u'' of the vapor since it is the energy infating the water from liquid to vapor thus, creating the micro bubbles around each vapor molecule.

Notice at atmospheric pressure and 20°C the γ (the weight) of the air is roughly $\gamma = 1\text{kg/m}^3$ while that of the vapor is $\gamma = 0.01729$ or, almost 100 times less weighting and that even at 100°C the vapor (termed at such temperature STEAM) has $\gamma = 0.5977$ or, almost twice lighter than the air. What creates the vapor less weighting is that: in accordance with (the above explained details of Avogadro's law) at equal temperature and pressure the air and the vapor have equal by size volumes of their micro bubbles but, housing different by weight molecules. Thus, the molecular weight of the water is 18 while that of the air is 28.96 Because of that, as soon as the vapor is created, it instantaneously involve THE ARCHIMEDES' PRINCIPLE which DEFIES the Entropy and begin ELEVATING the vapor -without any temperature gradient neither at every meter nor at every 10 meters of the elevation; thus the FIST LEG ends with ending the vaporization of the water at point 2

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on the P, v surface of the 3 dimensional Bezentropic Diagram h, P, v of Fig 2.

THE SECOND LEG

consists in the elevation of the so generated vapor from ground level h_0 (starting from point 2 of Fig. 2) up to altitude h_1 at point 3 there. It works as follows: the elevation of the vapor occurs at adiabatic conditions (meaning without exchange of heat with the environment). That is because every cubic meter of vapor is elevated at zero temperature gradient which precludes any heat exchange with the environment. However, the science teaches that during any elevation of any weight is generated POTENTIAL ENERGY -on account of work from some other source of energy, for no one can violate the ENERGY CONSERVATION AND TRANSFORMATION LAW 61. Consequently, the elevation of the vapor from ground point h_0 to the altitude h_1 crates the following potential energy

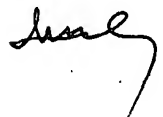
$$71. \quad E_p = A/g(h_1 - h_0) = A/g \cdot h [\text{Kcal. m}]$$

However, because the adiabatic character of the elevation is precluding any outside input of energy, the only source for that remains the latent heat of the vaporization of equation 70. The factor who drains entalpy 70 and convert it DIRECTLY TO POTENTIAL ENERGY is the force of ARCHIMEDES' PRINCIPLE. That force is causing a spontaneous elevation of the vapor since the generated vapor is lighter than the air..

That draining causes squeezing the micro bubbles because: the entalpy (the heat content) of the vapor is actually the kinetic energy of vapor's molecules -creating said micro bubbles (trough molecules' disordered reshuffling along theirs mean free paths).. That process of squeezing, is going up attaining the high altitude of point 3 and behind that altitude.

THE THIRD LEG

performs the condensation, of the (elevated to high altitude) vapor back to water -in form of rain. It starts from point 3 and continues to point 4 as follows: the elevation of the vapor up to point 3 generates a lot of potential energy (all coming from the latent heat of the vapor). That causes significant volume reduction of vapor's micro bubbles followed by aggregation of them down to microscopic water droplets of fog. This aggregation continues until the weight of the mixture of fog and vapor equalize with that of the air. When the equilibrium is attained that stop the further elevation of the mixture up to altitude h_2 of point 3' and thus, creates the clouds. Due to the equalization of vet vapor and fog's weight with that of the air, not all latent heat (of equation 70) is converted to potential energy because: said equalization stops the elevation of the moisture (the cloud) up to altitud h_2 . That is leading to the following new equation expressing the incomplet direct heat to potential energy conversion

Vm 

$$72. \quad A/g \cdot h_2 = (r - r_x) \text{ from where } h_2 = g/A(r - r_x)$$

THE ZIGZAG CONTINUATION OF LEG 3 COMPLETING THE CONVERSION.

The zigzag continuation of leg 3 is between points 3' and 4 and occurs around altitude $h_2 \pm x$. The formation of the cloud is between point 3 and 3'. There the concentration of cloud's fog is maximum, since at h_2 is the established equilibrium between the weights of the air and the mixture of fog and steam (representing the moisture of the cloud). Then, at suitable meteorological conditions [such as mixing the clouds with (condensing) dust particles from the air, sudden lowering of the atmospheric pressure and adiabatic lowering of the temperature] the fog's microscopic droplets aggregate into larger droplets, the cloud go down (below the h_2) and start raining. That generates the waterfalls; irrigate our entire planet and resupplies the oceans, the rivers, the seas and the lakes, with fresh water; thus, compensating them for the continuous and eternal water evaporation.

In the mean time however, the rain disturbs the weight balance between the air and cloud's moisture (vapor plus fog) since the fog is converted to rain and eliminated from the cloud. That is drying cloud's vapor and makes it again lighter than the air.

That immediately reactivates ARCHIMEDES' FORCE which is lifting the cloud for another time to the altitude $h_2 + x$. The new elevation generates additional potential energy and new droplets of fog, which are lowering the cloud back to h_2 and restoring the equilibrium thus, preparing the cloud for a new round of raining. After repeating that zigzag process -between point 3 and 4 (of the cycle)- for several times, all latent heat of vaporization (of equation 70) becomes heat of condensation at h_2 producing the rain there.

That way all that heat becomes fully converted to potential energy causing the full disappearance of the cloud.

That way is performed direct & total conversion of the heat to the potential energy

$$72. \quad r_1 = A/g \cdot h [\text{Kcals}] = h/g \text{ kg/m; where } G = 1, h = h_2 \text{ and } h_2 = r \cdot g$$

THE (LAST) LEG 4 OF THE CYCLE AND ITS UNUSUAL APPLICATION

The Leg 4 of this THERMO MECHANICAL CYCLE proceeds between points 4 and 1 of the cycle. It actually is widely used by all HYDRAULIC POWER PLANT in the word but, no one realized that is the last -purely MECHANICAL LEG- of of Mother Nature's THERMO MECHANICAL BEZENTROPIC CYCLE converting, *in full the latent heat* (of the vaporization) *first into potential energy and then to kinetic energy and work*. Specifically, the potential energy at point 4 of leg 4 is obtained by the zigzag condensation process happening between point 3 and 4 of the cycle producing the rain and the source of the waterfalls. Because the heat of the condensation is equal to the heat of the vaporization and

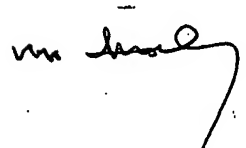
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because they both are used solely to transport water from ground level to the altitude level of the clouds the efficiency of that conversion is both full (100%) and free of charge because Mother Nature do not have cashiers. That free energy is then converted to KINETIC ENERGY by simple free fall of the water of the so created waterfalls from the altitude corresponding points 4 down to the ground altitude corresponding to point 1 of the cycle. Then, at point 1 the so obtained kinetic energy is converted to work or, to electricity by known HYDRAULIC TURBINES.

Seen in the above light, any hydraulic power plant is actually THERMO HYDRAULIC POWER PLANT because, what makes the used by them waterfalls is actually the above discovered and disclosed THERMO MECHANICAL BEZENTROPIC CYCLE of MOTHER NATURE. It is FULLY DEFYING THE ENTROPY as follows: (a) since is elevating the heat of the vaporization from the surface of the earth up to the clouds SPONTANEOUSLY (on its own) without temperature gradient at any meter of the elevation; (b) because is converting spontaneously and fully converting said heat directly into potential energy. (c) because the so obtained potential energy, is again spontaneously, fully and directly converted to kinetic energy and work from one only reservoir of heat which is also prohibited by the law of entropy and (d) because the discovered THERMO MECHANICAL BEZENTROPIC CYCLE and the rediscovered HYDRAULIC POWER PLANTS as BEZENTROPIC THERMO MECHANICAL HYDRAULIC PLANTS are perfect example of EXISTING AND WORKING PERPETUM MOBILE OF THE SECOND KIND (heat engine receiving energy for its work from one only reservoir of heat such as the atmosphere, the crust and the oceans) which is also prohibited by the law of entropy.

The error of Oswald and the classic thermodynamics

The energy reserve in the environment is practically unlimited. Thus, it has been calculated that if the amount of all forms energy used in the world is extracted from the oceans their temperature would be lowered by 1°C after 1700 years even if the oceans do not receive more energy from the sun. Because of that by the end of the 19 century appeared the idea of constructing heat engines working by heat extracted from one only infinite reservoir of heat such as the oceans and the atmosphere. Such hypothetical engine does not contradict the energy conservation law and was termed by Walter Oswald PERPETUM MOBILE OF THE SECOND KIND. He then proved that such engine cannot work because, there could not be temperature difference and therefore, it contradicts the SECOND LAW OF THE THERMODYNAMICS (a.k.a. LAW OF THE ENTROPY). Then, in accordance with that "prove" the Second law of the thermodynamics was restated as follows: "PERPETUM MOBILE OF THE SECOND KIND IS IMPOSSIBLE"; and that "inference"



was accepted both by the classic and the quantum thermodynamics.

Of course that inference is correct but, ONLY WHEN ONE IS 100% IGNORANT ABOUT MOTHER NATURE'S LAW OF THE BEZENTROPY WHICH ALLOWED HUMANS TO BUILD THE CLARIFIED TERMO HYDRAULIC POWER PLANTS.

MOREOVER, THEY ARE ALSO PERPETUM MOBILES OF THE SECOND KIND SINCE ARE PERFECTLY WORKING USING HEAT FROM ONE ONLY RESERVOIR OF ENERGY WHICH IS THE (WATER AND CRUST) SURFACE OF THE EARTH.

A More practical Cryogenic thermo-mechanical bezentropic cycle for heat to potential energy and to work conversion

Generally, this cryogenic cycle is same as the above described Hydraulic thermo mechanical cycle but, of course it ^{has} two improving changes. The first of them is that the working body of the cycle and its engine is not the water but, a *cryogenic liquid*. 06-06-03
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That difference is important since is replacing the natural waterfalls with artificial but again spontaneous cryogenfalls. That removes the need for mountains high up to the clouds and replace them with tubular tripods not higher than a third of the Eifel tower. Other advantages from the cryogen working body are: (a) very low boiling temperature - allowing to use the atmospheric air as efficient boiler of the working body thus, capturing more free energy from the environment- (b) very low latent heat of vaporization -allowing to evaporate very fast large quantities of cryogens and to condense them back to liquids at affordable altitudes by tubular elevation of their vapors; (c) the liquid cryogens are heavier than the water and therefore even more suitable for rotating hydraulic turbines than the water; and (d) in addition of heating by the air, the cryogens allow also efficient heating by fuels, by hot springs water and by sun light. See fig3(a) 06-06-03
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The most suitable cryogens are the FLUOROCARBONS and the FLUORO CHLORINE CARBONS known under the common name FREONS.

EXAMPLE: the FREON 12 (CF_2Cl_2) having boiling temperature of -30°C , has the following characteristics, at 20°C , in the area of the saturated (vet) vapor:

Pressure(ata) = 5.785; specific volume v' (as liquid) = 0.7534 L/kg; spec. volum v'' (vapor) = 0.0317 m^3/kg ; Spec. weight (liquid) = 1.327 kg/L; spec. weight (vapor) = 31.52 kg/m^3 ; ENTALPY: (liquid) = 104.56 Kcal/kg, (vapor) = 139.12 Kcal/kg; latent heat of vaporization = 34.56 Kcal/kg. It should be noted also that recently are marketed freons having even better properties and not deteriorating the protective OZONE LAYER of the atmosphere.

Because the better characteristics of the freons than these of the water a freon based termo mechanical hydraulic turbine would be better PERPETUM MOBILE OF THE SECOND KIND than the existing water power plants.

van der Meer

The second major innovation of the cryogenic thermo mechanical cycle is the very efficient bezentropic separation of the atmospheric air into hot and cold fractions applying the hot fraction to boil the working body and the cold fraction to accelerate the condensation of its vapor when is needed to increase the power of the power plant. That is attained by separating of the molecules of the air having high free path velocities from these of low velocities. This separation was an old dream of JAMES MAXWELL (1831-1879) which at long last came true by ^{my} rediscovering and modifying the WORTEX TUBE of the French physicist GEORGE RANQUE as a BEZENTROPIC DEVICE. George Ranque invented it by accident in 1928. The original tube work using a classic compressor delivering a pressure of 80 to 100 PSIG, from ~~that~~ pressure generates, in the vortex spin chamber, revolutions of up to 1,000,000 RPM. This, spiral like stream, revolves toward the hot end of the tube, where some part of the air is allowed to escape through a conical control valve. The spinning remained air is forced back trough the center of this outer vortex. In this conditions the inner spiral stream conveys most of its vortex kinetic energy (appearing as heat) to the outer spiral spinning stream and exits the vortex tube as cold air. The outer spiral spinning stream, accumulating more energy that way, excites the opposite end as hot air. The cold air that way can go down to -46°C and the hot air up to $+127^{\circ}\text{C}$ thus creating a temperature gradient of 173°C which is more than enough to cause preheated freon steam and thus to further increase the efficiency of the turbine of the bezentropic thermo mechanical cycle.

The efficiency of the so described wortex tube is further increased as follows:

The vortex tube is adiabatic device since there is no heat exchange with the environment.

Consequently the sum of the entalpy exhausted from its cold end, plus that exhausted from its hot end is equal to the entalpy of the imputed air from the compressor. Seen that way there is no losses of heat and from a purely thermodynamic point of view its efficiency is 100%. Since a vortex tube cannot work without an air compressor the overall thermal efficiency of the combination compressor + vortex tube depends exclusively of that of the compressor. However it is not only that (thermal) efficiency which we are looking for, but, also the EFFICIENCY OF THE SEPARATION BETWEEN ^{the} MOLECULES OF HIGH AND LOW KINETIC ENERGY (given by equation 46), WITHIN THE EFFICIENT ADIABATIC CONDITIONS OF THE WORTEX TUBE. That kind of efficiency depend on the ability of the cold vortex stream to transfer its energy to the opposite hot wortex stream and that ability depends on the rotary velociy of both streams. On the other hand that abilty depend on the linear velocity of the gas input and on the construction of the vortex chamber.

Taking into account all above I improved the classic "compressor-vortex tube" as follows:

(1) the classic compressor was replaced by the more energy efficient BEZENTROPIC COMPRESSOR the construction and the mod of operation of which is further disclosed in this paper since they are same as those used by the BEZENTROPIC TURBINE.

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(2) The linear velocity of the air inputted in the vortex chamber was increased by introducing a flat nozzle similar to that used and described related to said Bezentropic Turbine. and

(3) The vortex chamber was improved and modified by changing its volume into a spiral volume. The benefit from that is to further facilitate the air rotation in the vortex tube and in the meantime to eliminate the needed costly air filter (preventing the dust clotting of the tube) because, the spiral removes the need from the series of the tiny exhaust holes (of the chamber) causing the vortex revolutions of the air in the vortex tube.

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MOREOVER, when to such cryogenic power plant is added heating by fuel, its HEAT TO WORK CONVERSION EFFICIENCY would be always higher than 100% because, to the calories of the fuel would be added the heat of the hot air inputted by the vortex tube.

The so modified vortex tube is perfect BEZENTROPIC HEAT PUMP superior the classic heat pump and defying the law of the entropy because is defying the limitations of the REVERSED CYCLE OF CARNOT on which are based the CLASSIC HEAT PUMPS. Beside that it allows efficient direct heating of the water for home purposes. As of present neither the inventor of the original vortex tube (GEORGE RANQUE) nor anyone else noticed that it is a perfect BEZENTROPIC DEVICE since no one else (beside this inventor) realized that beside the LAW OF ENTROPY there exists also the LAW OF THE BESENTROPY.

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The details of construction of the above described CRYOGENIC BEZENTROPIC POWER PLANT AND ITS IMPROVED (and rediscovered as bezentropic) VORTEX TUBE ARE GIVEN ON **Fig. 3(b).** where: 1 represents the bezentropic compressor of the vortex tube delivering

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the needed 5 to 8 atmospheres of pressure. ne electric motor^{is} rotating the compressor. That compressor has a spiral rotor 1' delivering only dynamic pressure, avoiding the losses of the heat associated with any static pressure. The dynamic pressure there is generated both: from the centrifugal force, created by the rotation of the rotor, and (mainly) by its concurrent action as a spiral piston. Part 2 is a flat nozzle (working similarly to the known nozzle of Laval) and delivering said dynamic pressure to the spiral air chamber³ of the vortex tube 3'. Part 4 is the conical regulator of the hot end of the tube and 4' is the obtained hot air which is then inputted into the heat exchanger 5 playing the role of heater of the freon. 5' is an exhaust air turbine whose role is to recuperate the kinetic energy remained after the heating. 6 represents the cold end of the vortex tube and 7 is turbine recuperating the kinetic energy of the cold end. 8 is a hose transporting cold

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air to the cooler 8' when is needed to increase the rate of the condensation of the freon in order to increase the power of this freon power plant. Each of the energy recuperating bezentropic turbines 5' and 7 rotate small own electric generators feeding a common battery not shown on Fig. 3(b). The tubes 9, 10 and 11 make the 100 to 150 meters high THREEPOD TOWER of this power plant ending with the cooler 8' where the freon steam is back condensed to liquid freon. Tubes 9 and 10 are of wide cross section since they both are transporting freon steam from the heater 5 up to the condenser 8'. tube 11 is of smaller cross section since its role is to deliver the linear kinetic energy of the liquid freonfall from cooler 8" down to the freon hydraulic turbine 12. Also there is an electric generator of this power plant connected with its power turbine 12, working by said freonfall.

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The so described cryogenic power plant works better as PERPETUM MOBILE OF THE SECOND KIND than the classic hydraulic power plants because, differently from the water, the freon boils at -30°C ; creates pressure of 5.785 ata at room temperature of 20°C which is sufficient to produce power even without heating by fuel and without help from the vortex tube. The vortex tube however is greatly increasing its efficiency because without any fuel has the capability to raise the temperature of the air, heating the freon, to over 50°C . At 50°C the obtained pressure of the freon is 12.405 ata (around 12.5 atmosphere) produced with minimal expenses of electricity since a vortex tube is much more efficient than a classic heat pump. That is because the heat and high temperature, in a classic heat pump, are obtained mainly by conversion of work into heat there, while in a vortex tube they are obtained mainly by adiabatic and spontaneous stripping heat from roughly half of the air molecule and instantaneously donating that heat the remained air molecule. Of course the so described cryogenic power plant can work more than perfectly also by fuel heating; and having efficiency of more than 100% (On account of stolen energy from the air) however, the use of fuel in this kind of power plants makes some sense only during winter time. Since the energy obtained from this power plant is free of charge (extracted entirely from the air) to reduce the capital investments one can use shorter than 100 meters high tubular threepod tower. Of course that would shorten also the 3-dimensional thermo mechanical cycle of the power plant, but that will not stop it to function. EXAMPLE: Fig 3(c) is the well known drinking toy bird (drinking for ever). It is actually a working prototype of a cryogenic power plant having drastically shortened thermo mechanical cycle. Its h_2 parameter is shortened down to about 2 centimeters and its working body down to about 3 grams of ethyl ether, but the toy is still working.

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Bezantropic cycle, turbine and power plant for direct conversion of heat to kinetic energy and then to work

From a purely efficiency point of view the cryogenic bezantropic power plant of Fig. 3(b) is perhaps the best invention which can be made. However, it is not practical for several purposes such as: for transportation vehicles, for chemical and other manufacturing processes requiring small own power plants, for aircraft, maritime and space vehicles. That calls for more diversity of the bezantropic devices, cycles and engines. To solve that diversity was invented the following helpful PLURALITY of

The Bezantropic devices

1. The two of them are the above described classic VORTEX TUBE and the modified -more suitable, for this invention- my **Bz** VORTEX TUBES. Then, looking to develop my BEZANTROPIC THERMODYNAMICS,

2. I noticed that the old NOZZLE of LAVAL was not fully understood, nor appreciated, by the science, that: it is ^{by spontaneous rectification of the molecular} ~~IT IS~~ ^{the natural} ~~DEFYING THE ENTROPY~~ ^{of which it is a} ~~DISORDER~~ ^{into order} ~~thus, following~~ ^{the natural} ~~LAW OF THE ORDER, on account~~ ^{of which it is a} ~~PERFECT BEZANTROPIC DEVICE~~. I named that new law also the LAW OF BEZANTROPY. Said nozzle, given on Fig. 4(a), represents a short tube of special profile performing efficient **hyper** velocity acceleration of any JET of gases, or/and steam, passing through that nozzle. Its entrance is made convergent to perform an initial acceleration and after that *divergent to provoke a second acceleration of the Jet*. Its convergent part causes a strong preliminary acceleration of the pressured fluid using the FIRST LAW of BERNOULLI (a.k.a. the law of continuity):

73. $W.Cs = \text{Constant}$; where: W = velocity and Cs = Cross section

Evidently, with the narrowing of the cross section of the nozzle, the velocity of the passing fluid must increase to conserve the value of the constant. The purpose of the divergent part of that nozzle is to cause a second strong acceleration, of the jet, by using the SECOND LAW of Bernoulli:

74. $P_s + P_d = \text{Constant}$; where: P_s = static pressure and P_d = DYNAMIC PRESSURE = $G/2g \cdot W^2 = m/2 \cdot W^2$

Evidently when $P_s = 0$ then, P_d must increase another time until equalizes with that new constant. Both constants of the velocity increase depends on the beginning pressure and temperature of the fluid. That dependence plus the dependence on said 2 laws of Bernoulli is experimentally shown by the diagram of Fig. 4(a), for steam as working body.

From there one can easily find out that (for example) at steam temperature $t = 400^\circ\text{C}$ and Pressure = 20 ata, the velocity of the fluid is $W = 1000$ m/sec which is more than 3 times the velocity of the sound; and that at pressure of 24 ata the velocity becomes

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1200 m/sec which is roughly 4 times the velocity of the sound. In such condition the entire HEAT inputted in the nozzle of Laval becomes converted to LINEAR KINETIC ENERGY at the end of the nozzle. That is because, as seen from equation 74, the dynamic pressure P_d of the fluid is equal to KINETIC ENERGY. Due to above theoretical and experimental facts, an well calculated and polished nozzle of Laval *converts practically completely (by efficiency of 99%) the inputted HEAT ENERGY into outputted KINETIC ENERGY*. The required angular divergence of the nozzle depends on the initial pressure and temperature of the fluid and is 7° to 12° . The formulae calculating the paramrters (length, convergence, divergence, minimal cross section) are given in any good university of technical book on thermodynamics.

4. The nozzle of Laval is rediscovered as bezentropic device only in this patent because: the modern science did not realized yiet the existence of the LAW OF OREDR in the universe which I termed also LAW OF BEZENTROPY *When discovered* it.

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5. It is this invention and its (startling) bezentropic devices which established the BEZENTROPIC THERMODYNAMICS. The VORTEX TUBE and the NOZZLE of LAVAL existed before, HOWEVER, they alone cannot perform BEZENTROPIC CONVERSION OF THE HEAT INTO WORK ~~FOR~~ THEY NEED FOR THAT MY BEZENTROPIC ROTORS, WHICH WERE NOT KNOWN BEFORE.

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The 6 new Bezentropic devices are: a FLAT NOZZLES shown on Fig.4(b); another FLAT but, VARIABLE NOZZLE, shown on Fig 4(c) -both relevant devices of the invention. Other 2 new devices are the BEZNTROPIC ROTORS^{and Stators}. Still another represents the bezentropic ELLIPTIC COMPRESSOR of Fig 8(a,b,c)

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The sixth is the ADVANCED VORTEX TUBE of the invention shown on Fig.7b and Fig.10 having: a special (improved) vortex chamber 1 possessing one or more spiral canals -similar to these used in the bezentropic rotors. They are used to accelerate the 2 opposing -inner and outer (enveloping the inner) vortex traveling jets inside the tube. That vortex chamber is fed with air by the Flat Nozzle 2 [shown also on Fig. 4(b)]. The flat nozzle receives air from the special ELLIPTIC COMPRESSOR 3, supplying the vortex tube with the necessary pressurized air. Large vortex tubes may use also TWO STAGE ROTARY COMPRESSOR like that of Fig.5(b).

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The second flat nozzle, shown on Fig 4(c), is indispensable for the construction of the bezentropic turbines of Fig.6(a) shown there as DEVICE IV(a,b). It is both flat and variable.

This invention is using also the original nozzles of Laval but, not to obtain efficiency; hence, not needing the classic formulae to design them. That down grading is

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because (like in the gasoline carburetors) they are used only to facilitate the input of the fuel; and to generate blended gases and steam working body.

Since the input cross sections, of both flat nozzles, given on Fig. 4(b) and Fig 4(c) look like slits, they are provided with feeding tubes -having the same slits apertures- fastened their nozzles. Somewhat different is the nozzle of Fig.4(c): it represents divergent box Inside of which are housed 2 convergent and then divergent sliding valves 3 and 4 which together with the walls of the housing them box, are forming said variable flat nozzle. 3 and 4 are driven by a small electric servo motor. On Fig.6(a) it is shown as DEVICE IV(a,b). The working body (coming from said supply tube) first passes through the convergent part of the variable nozzle -when it gets its initial acceleration- and then through the divergent part of the flat variable nozzle where is accelerated a second time. Said divergence is in the order of 8° to 10° and follows the shape of the slit. The performance of said two flat nozzles is also based on the above 2 laws of Bernoulli. The worldwide known SAN GORGONIO PASS in California is EXAMPLE for wind creating Bezentropic "nozzle" of MOTHUR NATURE.

Correlation between energy conversion efficiency and the law of order

Differently from Clausius, Ludwig Boltzman derived the entropy S from the disordered motion of the gas molecules and redefined it as a statistical LAW OF DISORDER in the universe expressed as follows:

75. $S = k.H = k.LnW$; where k is the known Constant of Boltzmann and W is the thermodynamic probability expressing the macro state of a gas (of N_1 molecules) as function of molecular distribution of its micro state volumes ΔN_1 -expressed by their molecular velocities- given by the expression:

$$76. \quad W = N! / \Delta N_1! \Delta_2! \Delta_3! \dots \Delta_e!$$

Contrary to that disorder, gas (or steam) jets blown from the nozzle of Laval or from the flat nozzles of this inventions are in full (spatial and velocity) molecular ORDER because, the movement of the molecules there unite in colinear and complanar vectors of velocity and impulse. In these conditions any molecule tending to become delayed would be simply pushed by its neighbors to follow the common stream. As a result of all that, at sonic and supersonic velocities, the median free path of all molecules there stretch and equalize with the common velocity of all molecules of the stream. All this means that in such conditions a good nozzle is capable to convert in full the ENTALPY j of a gas (or steam) into linear kinetic energy because: the internal energy du contained in the j

-which is latent kinetic energy- is also fully converted into linear kinetic energy.

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Then, the efficiency of that conversion η is not that of the cycle of Carnot

75. $[\eta = (T_2 - T_1)/T_2]$; BUT: 75. $\eta = j(1 - 1\%) = du + A(Pdv + v dP) - 1\%(\text{of } \eta) = G/2g \cdot W^2 - 1\%$
or, almost 100%.

The phenomenon by which the nozzle of Laval dictates said direct and full conversion of the heat into linear kinetic energy IS THE SPONTANEOUS MOLECULAR ORDER STIMULATED BY THAT NOZZLE. Similar stimulation is obtained also by the above disclosed 2 FLAT NOZZLES because, like the nozzle of Laval their function are also based on the FIRST and the SECOND LAWS of BERNOULLI.

In the above disclosed Bezentropic cycle for direct and full conversion of the heat into potential energy and to work, the phenomenon which dictate that is also causing a SPONTANEOUS ORDER ordering all molecules of the vapor to elevate from the ground to the clouds on its own. That order is stimulated, NATURALLY, by the concurrent action of the spontaneous latent heat of vaporization and the law of Archimedes.

Naturally or artificially, the result from both kind of stimulation ARE CREATING SPONTANEOUS ORDER, THE END RESULT OF WHICH IS PRACTICALLY FULL CONVERSION OF THE HEAT INTO WORK.

MOREOVER, THAT CONVERSION COULD BE EVEN MORE THAT 100% EFFICIENT WHEN IS STIMULATED THE SPONTANEOUS ORDERLY EXTRACTION OF HEAT ENERGY FROM THE ENVIRONMENT THROUGH CRYOGENIC BEZENTROPIC CYCLES.

The bottom line from all above is that CONTRARY to the DISORDER of the ENTROPY -BADLY VIOLATING THE SYMMETRY OF THE MUTUAL ENERGY CONVERSION BETWEEN THE HEAT AND THE OTHER FORM OF ENERGY- the LAW OF THE BEZENTROPY -AS A LAW OF ORDER IN THE UNIVERSE- IS RESTORING THAT SYMMETRY WHENEVER IS FOLLOWED ITS RIGOR.

Delusive disappointments by ignorance

Evidently, the nozzle of Laval is DEFYING REMARKABLY the ENTROPY. That phenomenon, however was not understood by the classic thermodynamics because: when that nozzle is applied to a classic gas or steam turbine, to increase its efficiency, it fails to do that. Similar failure happens when same nozzle is used for JET PROPULSION purpose.

Due to these very misunderstood failure no scientist was able to see that they are delusion due to the following human gross errors :

(1) no one realized that the molecular disorder of the gases and steam can be turned to spontaneous order and that complete heat to work conversion can be performed only through molecular order like that of the gas or steam jets, caused by the nozzle of Laval; but, in condition that said order is not destroyed till the end of the heat to work

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conversion; and more: the necessary MOLECULAR ORDER can be created also by the law of Archimedes and by all other Bezentropic devices of this invention.

(2) no one realized that any classic heat engines or turbine is mere mechanical integrator of the molecular energy of gases and steam but only if they are in MOLECULAR DISORDER. CONSEQUENTLY, when in any classic engine or turbine is inputted jets of ordered gas or steam molecules they instantaneously destroy their ORDER and put them in DISORDER; then only they can perform the mechanical integration. EVICENTLY,

(3) it makes no sense to provide a nozzle of laval to a classic turbine for more efficiency since the molecular order -stimulated by the nozzle- is automatically destroyed by the thousand turbine blades of the classic turbines. Hence, when a jet is inputted in a classic turbine for heat to work conversion it is forced to abandon the "jurisdiction" of the LAW OF ORDER and forced adopt the jurisdiction of the LAW OF THE DISORDER (of the thermodynamic jungle). That slashes the efficiency of the heat to work conversion from roughly 100% down to about 30%.

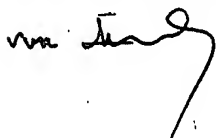
Since the differentials of the heat energy of ORDERED molecular movements are always TOTAL DIFFERENTIALS and these of the DISORDERED molecular movement ALWAYS PARTIAL DIFFERENTIALS OF THE HEAT, it explains why all classic heat engines and turbines can mechanically integrate only partial differentials of the heat. EXAMPLES: (a) the spontaneous elevation of the vapor from the ground to the clouds producing potential energy having always total differential, (b) the spontaneous conversion of the entalpy to linear kinetic energy by the nozzle of Laval and the flat nozzles of this invention yielding again total energy differentials and (c) the spontaneous conversion of the heat to rotary kinetic energy, by the bezentropic rotors of this invention also yielding total differential.

The total energy differentials are therefore synonyms of ORDER and BEZENTROPY, while the partial energy differentials are synonyms OF DISORDER and ENTROPY.

(4). Notwithstanding that the nozzle of Laval is fully converting the heat into linear kinetic energy it is bad performing as jet propulsion device. That is however not because of switching to the rigor of the entropy but, because -in the conditions of the jet propulsion- most of its kinetic energy is exhausted without benefit in the atmosphere. Since the gilt for that is not the kinetic energy but, this is telling that one must invent for jet propulsion another, more suitable bezentropic device -like that one later described in this disclosure.

Turbine rotors without turbine blades

Summarizing the result from all above research clarified that it is not enough to have perfect nozzles for full heat to work conversion. That is because any nozzle is yielding only LINEAR-KINETIC ENERGY while a heat to work conversion requires ROTARY



KINETIC ENERGY

$$E_{rk} = I\Omega^2/2 \text{ where } I = \text{moment of inertia and } \Omega = \text{angular velocity}$$

WHICH SHOULD BE OBTAINED ONLY BY ROTORS WHICH MUST NOT DESTROY THE MOLECULAR ORDER OF THE GAS (OR STEAM) WORKING BODY. AS ALREADY DISCLOSED THAT ORDER IS STIMULATED BY THE USED NOZZLE(S) AND IT DOES NOT OBEY THE LAW OF ENTROPY.

Looking for the right solution was inferred that the needed special rotors and their corresponding stators must get rid of the classic turbine blades since they automatically destroy the molecular order of the working body (created by the nozzles). That way I invented the BEZENTROPIC ROTORS BASED ON SPIRAL CANALS useable both for bezentropic turbines and compressors as given on **Fig.5(a,b)**. There Fig.5(a) displays the bezentropic rotor destined for a bezentropic turbine where: 1 is axle of its reel 2 on which are winded and welded the spiral metal sheets 3 and 4, forming the spiral canals 5 and 6. The preferred number of the spirals is two; however, they could be also more than 2. Parts 7 represent flat nozzle based on said laws of Bernoulli. 9 is the cylindrical stator of the rotor; 10 and 11 are side lids of the stator; 12 are apertures of the reel and 13 apertures of the side lids. The purpose of the rotor as turbine is to convert the linear kinetic energy coming from its nozzles to ROTARY KINETIC ENERGY WITHOUT DISTURBING THE MOLECULAR ORDER OF THE GAS OR STEAM FLOW COMING FROM AND STIMULATED BY THE NOZZLES. In that respect the rotating fluid acts exactly as a rotating gas pistons pushing the metallic spirals and converting the rotary kinetic energy of the fluid into work. The efficiency of this kind of heat to work conversion is much better than the efficiency of any classic heat engine or turbine clarified by the following simple consideration:

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(a) The exponent of the temperature T in the efficiency η of the gedanken engine of Carnot (which is the theoretical limit for any classic heat engine and turbine)

$\eta = (T_2 - T_1)/T_2$; is on FIRST POWER while these of the above nozzles and of rotor bezentropic turbines' rotors are on SECOND POWER since their efficiency formulae are

$$76. \eta_w = m/2(W_2^2 - W_1^2) \text{ and } 77. \eta_w = I/2(\Omega_2^2 - \Omega_1^2) \text{ respectively.}$$

EXAMPLES FROM THE CONSEQUENCES OF SAID DIFFERENCE:

(a₁) a steam turbine having $T_2 = 300^\circ\text{C}$ and $T_1 = 100$ never can attain the theoretical limit of the cycle of Carnot for said temperatures which is

78. $\eta = (300 - 100)/300 = 2/3 = 66.(6)\%$ while those of the nozzle of Laval and the bezentropic rotors having linear and circular velocities respectively equal to $W_2 = 300$ m/sec, $W_1 = 100$ m/sec, $\Omega_2 = 300$ rad/sec, $\Omega_1 = 100$ rad/sec would have efficiencies

v.m. line

(assuming for simplicity $m = 2$ and $l = 2$):

$$79. \eta_w = \eta_Q = [300^2 (= 100\%) - 100^2 (= x\%)] = 90,000 (= 100\%) - 10,000 (= 10\%) = 90\%$$

Fig.5(b) represents a bezentropic compressor. Its purpose is to eliminate the static pressure (since causes heating and loss of heat) and replace it by DYNAMIC PRESSURE for it does not elevate the temperature and because the bezentropic turbines work by dynamic pressure. The rotor and the stator of the bezentropic compressor have generally the same construction as that of the above described bez. turbine rotor of Fig.5(a). Its difference with Fig. 5(a) is that it needs only one nozzle mounted in reverse position as shown on Fig.5(b) and that the inputted air there is not introduced through its nozzle but, through its side apertures 12 and 13. The nozzle there is used as a valve, to exhaust the air jet. The dynamic pressure there is obtained by spinning the rotor at high R.P.M. where to the obtained centrifugal force is added also the push of the rotating spirals which are acting as a rotary pistons.

The bezentropic turbine and its cycle; performing direct & complet heat to kinetic energy and to work conversion

Said bezentropic turbine is given on **Fig.6(a)** and its thermo mechanical cycle on **Fig. 6(b,c)**. The turbine includes the following above described *bezentropic devices*:

- (a). A two stage BEZENTROPIC COMPRESSOR where I is its first stage and II is its second stage both having essentially the same construction;
- (b) III is a water cooled CHAMBER OF COMBUSTION getting the necessary air by the second stage II of the compressor.
- (c) IV(a) represents a NOZZLE'S CHAMBER of the VARIABLE FLAT NOZZLE IV(b)
- (d) V(a) is the BEZENTROPIC ROTOR of the turbine, rotated inside its STATOR V(b)
- (e) VI is the AXLE of the ROTATION of the turbine. Is rotate also its bez. compressors.
- (f) VII represents an electrical SERVO MOTOR monitoring the opening and the closing of variable nozzle IV(b).
- (g) Is a starter -not shown on the drawing- consisting of an electric motor with bendix.

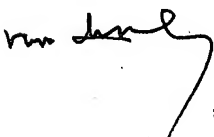
The so described BEZENTROPIC TURBINE works as follows:

using said starter the operator starts rotating the turbine and its compressors until are obtained about 1000 revolutions per minute. That angular velocity is sufficient to cause the turbine to rotate and wok on its own as follows: The first stage I of the compressor start sucking pure air from its four apertures 1. The combined centrifugal plus mechanical force -of the rotating spirals 2 of the rotors, acting as a rotating piston- of the compressor, instead causing a static pressure accelerate the inputted air to enormous velocity and that way instead obtaining compressed air is obtained continuous air flow

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having practically only dynamic pressure; then that flow -as shown by the arrows on the drawing- enters in the second stage II of the compressor where the air flow is further accelerated because the second stage has a larger rotating diameter. The so accelerated air flow gets a third acceleration by the nozzle of Laval where the DYNAMIC PRESSURE of the air flow becomes maximum and somewhat higher than the STATIC PRESSURE of the combustion chamber III. Another role of the nozzle of Laval 3 is to facilitate the necessary input of fuel inside the combustion chamber. When that fuel is natural gas it is inputted through the valve 4 of the nozzle. When the fuel is liquid it is inputted through the carburetor 5. That way the nozzle 3 is blowing inside the combustion chamber a regulated combustible mixture of air and fuel. Once that mixture is ignited by the spark plug 6 the combustion process becomes continuous. The water cooled combustion chamber III is made sufficiently long to make the mixture completely combusted before leaving the chamber through the second nozzle 7. The role of nozzle 7 is to provide convenient place and space for injection and mixing pulverized hot water within the very hot combusted gases through the valve 8 without troubling the combustion process. When that pulverized water gets contacted with the combusted gases it immediately FLASHES into steam and that converts the working body into a blend of gases and preheated steam. That diminishes the temperature of the body but not its pressure and ENTALPY (its heat content) because, the process of the FLASHING is INSTANTANEOUS and ADIABATIC (without heat exchange with the environment) and because lowering of the flashing of the water into preheated steam is producing more working body which conserves the entalpy. Then, the so augmented working body enters into the CHAMBER IV(a) of the VARIABLE FLAT CONVERGING-DIVERGENT NOZZLE IV(b) accelerating the working body into a supersonic jet. The nozzle is doing that by double acceleration of the air flow. The first acceleration is performed by the converging section of the nozzle -invoking the action of the FIRST LAW 73 OF BERNOULLI. The second acceleration is caused by the divergent section of the nozzle -invoking for that the SECOND LAW 74 of BERNOULLI.

What is equally important in the so generated SUPERSONIC JET is: that the working body inside chamber IV(a) till its entrance in the the nozzle IV(b) is (PORTER OF) HEAT, caused by its own MOLECULAR DISORDER. However, due to the enormous (supersonic) velocity acceleration by the nozzle, when the same working body just leaves the nozzle it reappears as (PORTER OF) LINEAR KINETIC ENERGY and not anymore as heat. That is because the nozzle stimulates a spontaneous rearrangement of the initial molecular DISORDER into COMPLETE MOLECULAR ORDER GETTING UNIFORM SUPERSONIC VELOCITY



AND IMPULSE; THUS, RECTIFYING (in the mean time) THE LATENT KINETIC ENERGY OF EACH MOLECULE (known as internal heat energy du ; caused by the TO AND FRO molecular RESHUFFLING inside each micro bubble of each molecule) INTO LINEAR KINETIC ENERGY.

In the meantime the FREE MEDIAN PATHS of each molecule gets RECTIFIED into uniform (for every molecule) velocity vector, equal to the supersonic velocity vector of the JET, creating an integrated uniform impulse. That converts the internal heat energy du , of each MOLECULE, into integral the linear kinetic energy $E_k = G/g W^2$ of the jet.

All this means that the nozzle is both spontaneous converter of the MOLECULAR DISORDER into MOLECULAR ORDER and MECHANICAL ENERGY INTEGRATING DEVICE.

The molecular disorder is producing STATIC PRESSURE and HEAT (ENTHALPY, which is a SCALAR), while the MOLECULAR ORDER (caused by a good nozzle) of a gas or steam is producing DYNAMIC PRESSURE and linear velocity (which is a VECTOR), integral impulse $P = m \cdot W$ and LINEAR KINETIC ENERGY $E_k = G/g W^2$. Evidently this is complete conversion of the ENTHALPY (the heat content of the working body) into KINETIC ENERGY.

Accordingly, any good NOZZLE (using efficiently said FIRST and SECOND LAWS of BERNOULLI) is a BEZENTROPIC DEVICE, defeating the entropy and following the LAW OF THE ENTROPY.

The rediscovery of the nozzle of Laval as bezentropic device stimulated me to look for and discover the MORE PRACTICAL, for this invention, FLAT and VARIABLE FLAT NOZZLES like that of IV(a,b).

The practical efficiency of an well designed and polished NOZZLE of LAVAL is 99%. That is fully defying the Second Law of the classic thermodynamics (the ENTROPY) and is best witness about the rigor and the reality of the BEZENTROPY. The miracle brought by the NOZZLE of LAVAL and said FLAT NOZZLES of this invention is the phenomenon that: whenever one input in them HEAT, is immediately obtaining KINETIC ENERGY at theirs outputs, by a STARTLING EFFICIENCY close to 100%.

UNFORTUNATELY, the linear kinetic energy is not practical for direct utilization. The people (and the industry) need rather ROTARY KINETIC ENERGY $E_{clr} = 1/2 I \Omega^2$ (where I = moment of inertia and Ω = angular velocity) because, the rotary kinetic energy is work and also easy convertible to electricity. That task now is performed but, very inefficiently, by classic engines and gas and steam turbines. This is a very poor solution. It is killing the efficiency of the nozzles when they are used in the classic turbines. That is because, the molecular order of the jet becomes instantaneously DESTROYED by the thousands turbine blades of the classic turbine rotors and stators. That immediately converts the gained (by the nozzle) KINETIC ENERGY back to HEAT (enthalpy) and back to the unfortunate law of



ENTROPY.

That is why no classic turbine can escape the efficiency barrier of the CYCLE OF CARNOT; even when is using best nozzles to blow in them jets of gas or steam.

Once deciphering that trouble I started to look for a TURBINE WITHOUT TURBINE BLADES. The good faith favored me to solve that centuries old difficult problem. The found right solution is the BEZENTROPIC TURBINE given on Fig 6(a). Its STATOR V(b) has no turbine blades, nor anything else. It is simply a cylindrical box where at its outside periphery is/are fastened one or more VARIABLE FLAT NOZZLE IV(a,b). Inside of that stator is rotated, through axle VI, the BEZENTROPIC ROTOR V(a). On that rotor all classic turbine blades are equally eliminated and replaced by the bezentropic SPIRAL CANALS 2' -formed by the coiled into evolvent type sheet spirals 2. Such sheet spirals are used also in the bezentropic compressors I and II. The role of said spiral canals 2' is to convert the LINEAR KINETIC ENERGY -blown from said flat nozzle IV(a,b)- into ROTARY KINETIC ENERGY; but, doing that by fully PRESERVING the molecular order caused by said nozzle. The rotary kinetic energy is generated by the continuous push, of the working jet upon said spirals, until its full linear energy is depleted. The so depleted working body (jet) is then exhausted out of the turbine through the shown apertures and arrows indicated on Fig.6(a).

The efficiency of the bezentropic turbine is not limited by the limitations of the cycle of Carnot, since the bezentropic rotor of the turbine it is not converting heat to work but, LINEAR KINETIC ENERGY (kind of mechanical energy -coming from its FLAT VARIABLE NOZZLE) into ROTARY KINETIC ENERGY (another kind of mechanical energy, fully equivalent to WORK). As is revealed by the physics no mechanical kind of energy respects the entropy. Because of that the efficiency of the BEZENTROPIC TURBINE IS:

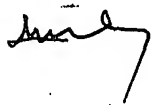
$$80. \quad \eta_{Bz} = l_2/2 \cdot \Omega_2^2 - l_1/2 \cdot \Omega_1^2$$

For practical purpose however it is more convenient to use the formula

81. $\eta_k = m/2(\omega_2^2 - \omega_1^2)$ where ω_2 = linear velocity of the working body leaving the nozzle to enter in the brzentropic rotor and ω_1 = linear velocity of the working body leaving the bezentropic rotor.

THE THERMO MECHANICAL CYCLES OF THE BEZENTROPIC TURBINE:

They are displayed on Fig.6(b,c) and they are 4 (four) dimensional diagrams. Its dimensions are: the dynamic pressure P_d created by the bezentropic compressor; the volume V of the working body; its linear velocity ω and its rotary velocity Ω . Non of them is mutually perpendicular one to the others; and its (4 dimensional) surface has nothing to do with the efficiency of the cycle. In this conditions the 4 dimensional Cartesian

vm 

coordinate of the cycle are fully arbitrary and serves only to obtain a convenient visual virtual picture of the cycle. Its beginning LEG 1-2 -given on the Pd, V surface- represents the dynamic pressure as function of the Ω and ω . LEG 2-3 is the *gained kinetic energy from the acceleration* LEG 3-1 is the *obtained work by the* *via* the flat nozzle IV(a,b) of the turbine. Notice that at point 1 of the cycle (which depicts the fluid input in the Nozzle) the energy of the working body there is HEAT, while at point 2 (which depicts the jet output of the nozzle) the heat dose not exist anymore, since is entirely converted to linear kinetic energy (a kind of MECHANICAL ENERGY). LEG 3'-1 represents the conversion of the Linear Kinetic energy into ROTARY KINETIC ENERGY (which is another kind of MECHANICAL energy). *It is also conversion of the* ROTARY ENERGY into WORK.

Because the dynamic pressure Pd is a vector having the same *value and* direction as that of the velocity ω , the *just described cycle is* represented also as shown on Fig. 6(c). There are no T,S diagrams in the BEZENTROPIC THERMODYNAMICS because, there is NO ENTROPY (S).

The Cryogenic Bezentropic Turbine

The main purpose of the cryogenic bezentropic turbine of Fig. 7(a,b) is extraction of energy and work from one only reservoir of heat, such as they are the atmospheric air, the thermal springs, the seas and the oceans. Of course, it can work also by fuels. The recently synthesized new ecological FREONS are providing perfect opportunity for bezentropic cryogenic turbines. Such freons, boiling at about -30°C , are providing a pressure of about 6 atmospheres at room temperature of 25°C and about 13 atmosphere at temperature of 55°C , extracted again from air of room temperature; spending for the purpose close to zero energy, when as in the cryogenic turbine of Fig 7(a) are used the ADVANCED BEZENTROPIC VORTEX TUBE and the BEZNTROPIC ROTORS of this invention. By using such advanced devices one can obtain even of up to 150°C temperature from room temperature air. No classic heat pumps can do that at such low expense of energy.

The rotors and the nozzles of the Cryogenic Turbine are similar to these of Fig. 6(a) and its device IV(a,b). However, it does not use the two stage spiral compressor nor the combustion chamber of Fig. 6(a). That is because the cryogenic turbine *works* ^{on} CLOSED CYCLE using the recently developed 'ecological freon' and freone steam, heated and preheated by the atmospheric air. A substantial advantage of the freon is that it can be easy evaporated and condensed since its latent heat of vaporization is only about 30 kcal/kg and because the freon steam is very heavy: at 50°C 1m^3 freon steam weights

about 69 kg wile, that of the water steam (at the same 50°C) is only 0.083kg/m^3 . At 100°C it is about 0.60 kg/m^3 and attains weight of 1 kg/m^3 at about 116°C .

Another novelty is the used ELLIPTIC BEZENTROPIC COMPRESSOR of Fig.8(b) used to deliver, the needed by the vortex tube pressured air .

All other bezentropic devices have same constructions as these already disclosed. Because of that repetition Fig.7(a) is drawn mostly as a BLOCK DIAGRAM of the claimed cryogenic turbine, which is working as follows:

device VIII of Fig. 7(a) represents said ELLIPTIC BEZENTROPIC COMPRESSOR the details of which are given on Fig.8(a). It is one stage elliptic rotary compressor having the purpose to deliver to the VORTEX TUBE IX the needed air of 5 to 8 atmospheres. The details of the above described VORTEX TUBE are given on Fig 7(b). The aims of the bezentropic vortex tube is as these of the classic HEAT PUMP but, not using REVERSE thermodynamic cycle, is fully DEFYING the ENTROPY and the efficiency η^{-1} of the REVERSE cycle of Carnot:

82. $\eta^{-1} = T_2/(T_2 - T_1)$ not allowing to have reasonable efficiency for large temperature differeces. The vortex tube (discovered in 1928, by chance by the French physicist GEORGE RANQUE ~~and~~ ^{no one} noticed that it is a besentropic device) is based on the so named MAXWELL'S DEMON. James Clerk MAXWELL (a great 19 century physicists) foresaw it as follows:

"Since heat involve the movement of molecules, we might someday be able to get hot and cold air from the same device with the help of a "friendly little demon" who would sort out and separate the hot and cold molecules of air".

Namely such a task is performing the vortex tube and that is why it has nothing to do with the classic heat pumps. The construction of a vortex tube is such that it creates two opposing longitudinal traveling air vortexes (spirals); one of them traveling inside the other and in opposing direction. In these conditions the inner traveling vortex air spirals releases much of its heat content to the wrapping it vortex air spiral -traveling in opposite direction. That way one of the two end of the tube starts blowing out hot air attaining up to $+150^{\circ}\text{C}$, with suitable adjustment vortex valve v_x and the other -very cold air, down to -50°C . That way can be obtained a temperature difference of 180°C which is much more than needed for a cryogenic cycle. There is no loss of energy within the vortex tube since it is adiabatic and obeying the law of energy conservation, meaning that the sum from the calories obtained from the hot and the cold air plus the kinetic energy (expressed in calories), of the 2 vortex blowing ends is equal to the entalpy of the atmospheric air plus the energy spent by the elliptic compressor (expressed again in calories).

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Device X of Fig. 7(a) represents a boiler for freon steam generation, heated by the hot air of the VORTEX TUBBE IX. Device XI represent a small bezentropic servo turbine to recuperate the kinetic energy of the cold air exhaust of the vortex tube. The electrical generator and the battery added to the servo turbine are not showed on the drawing.

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After stripping its kinetic energy the cold air becomes super cold and is then, directed to the freon steam condenser XV. Device XII is another small servo turbine (like the XI) having the role of collecting the remained kinetic energy of the hot air exhausted from boiler X. Device XIII represents wide diameter tubular sun energy collector for additional heating of the freon steam (when there is sun). It is made from transparent material, the bottom half of which is aluminized to reflect the light toward its inner tub holding the passing there FREON STEAM; then, the so preheated steam go to the flat nozzle and the rotor of MAIN TURBINE XVI were its entalpy is converted to beneficial work.

The main turbine's exhaust consisting of mixed freon steam and freon is then, directed to the condenser XV converting the remained steam to liquid freon. It is then pumped out, by the pump P, to the boiler X for a new cycle of HEAT TO WORK CONVERSION. Naturally, when desired, the heating of the boiler could be maximized also by fuel. Device XIV represents another sun energy collector preheating air inputted to the the elliptic compressor. The elliptic compressor is rotated by the main freon steam turbine XVI.

THE ELLIPTIC COMPRESSOR

is displayed on Fig. 8(a,b,c). It is based on my discovery that beside its center and 2 focuses each ellipse has also 2 rotary centers allowing to rotate the small diameter of the ellipse almost as conveniently as one can rotate a diameter of an circumference upon its center; and more: when one rotate the large diameter upon said rotary centers he is obtaining a larger ellipse orthogonal to the first. Since the new ellipse has also its rotary centers using them and its diameters -as above- creates a third orthogonal ellipse and an infinite family of fractal orthogonal ellipses. I found said rotary centers first by way of pure logical reasoning and then used mathematics to calculate theirs exact coordinates.

In the beginning I reasoned that since every circumference could be modeled as an elastic (material) ring, smashing the ring may generate an ellipse. Actually, any ellipse and any circumference belong to the same family of the conic sections. Said smashing cannot smash the center of the circumference since it is not material. However, the smashing - and the law of action and counter action- creates concurrent bidirectional central pushing (along the small diameter of the ellipse) and bidirectional centrifugal stretch along the large axis (diameter) of the ellipse. It is obvious that namely the inflection caused by said

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bidirectional centrifugal stretch caused -springing from the center of the circumference- the 2 focuses of the ellipse. Obviously, the existing concurrent symmetry between the laws of the physic and of the geometry mandates that the bidirectional central pushing stress of the smashing must produce 2 more SPECIAL POINTS, again springing from the center of the circumference but, this time along the small diameter of the ellipse, again (like the 2 focuses) at equal distances from said center. Once arriving at the above conclusion I made the hypothesis that these (unknown to the science) 2 special points are actually ROTARY CENTERS allowing to rotate upon them the small diameter of the ellipse. To prove that I experimentally rotated the small diameter using them, while always sliding both extremities of that diameter upon the curb of the ellipse. That way I proved experimentally my hypothesis and it is shown on Fig.8(b). Then, to prove also theoretically I decided to find out the coordinates of said 2 rotary centers, mathematically, and then to test all cords passing through them for proving that they all have same length as that of the small diameter of the ellipse. MOREOVER, since according to the analytical geometry any ellipse and all of its elements are fully determined upon finding only 4 points of its curve said desired prove actually to identify the length of only 2 chords (passing to the rotary centers) of being equal to the small diameter. The following analysis demonstrates that one can find without difficulty at least 6 such chords. That is more than enough for the prove. Said prove used the drawings of Fig.8(a,b) and the analytical equation of the ellipse:

$$83. \quad X^2/a^2 + Y^2/b^2 = 1$$

The best chords for the purpose are: $M_1 - M_2$ which is parallel to the large axis (diameter) of the ellipse and the chord $M_5 - M_6$ having common point M_5 with said axis. By such choice (shown on fig.8(a)) is obvious that the COORDINATES of the rotary center $M_{r1}(X_1, Y_1)$ are equal to

84. $X_{h1} = 0$; $X_1 = n = b$; $Y_{h1} = Y_1 = \pm b[1 - b^2/a^2]^{1/2}$; and the length of the chord $M_1 - M_2 = 2n = 2b$ which is the same length as that of the small diameter.

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By way of symmetry the coordinates of the other rotary center $M_{r2}(X_{r2}, -Y_{r2})$ are:

85. $X_{r2} = X_{r1} = 0$ and $Y_{r2} = -Y_{r1} = -\pm b[1 - b^2/a^2]^{1/2}$; To find the length of chord $M_5 - M_6$ is used the theorem of Pitagoras and the triangle $-a, Y_1, m_1$. from were is calculated m_1 and after that n_1 which yield $m_1 + n_1 = 2b$.

Evidently, by way of symmetry one can find, automatically, the same data for 4 more chords.

Fig.8(c) displays the practical use of the rotary centers where one of them is used to construct an regenerating elliptic bezentropic compressor. That is attained by making the length, of its elliptic rotary piston Rp, to fit exactly the small diameter of its elliptic stator Se. Its tightness is achieved by the 'bow shaped' segments Bs and teflon made rollers Tr. The free rotation of the rotor is achieved by the sliding canal Sc. Vv is a check valve. The sucking of the air is done by the apertures A1 and A2. Ex represents heath exchanging canal, performing air cooling of the compressor, causing in the mean time return of the heath, captured from radiation of the stator, back to the compressor. It is namely this captured heat, which makes the compressor both regenerating and semi bezentropic, since is recycling the entropic heat losses. The need for such regeneratting compressor arrives whenever are needed small size energy efficient compressors - like for example to supply air for a bezentropic vortex tube- because, spiral bezentropic compressors, having small diameters, require very high revolutions per minute causing problems for special water cooling bearings and other problems.

Fig.8(d) represent an elliptic engine. It uses the same rotary centers as in the elliptic compressor. The main difference with the elliptic compressor now consists in the built in the rotor 2 chambers of combustion. Its working cycle which is self explained by the working diagram given on Fig.8(e). Like in the case with the elliptic compressor, the need for such engine arrive whenever is needed rotary engine of small diameter but, still having large working volume and not the enormous shaft RPM like these of WANKEL'S ENGINES (to attainn air tightness) thus, requiring heavier than the engine transmission.

Of course the efficiency of such engine cannot compete with the efficiency of the bezentropic turbine of Fig. 6(a). It cannot avoid in full the entropic losses of heath only by trying regeneration of the heat.

BEZENTROPIC VORTEX PROPULSION

It is given on Fig.9 and is necessary for comprehensive solution of the ecological problems of our 21st century since the classic jet propulsion is both inefficient and over polluting. Today the tens of thousands military, civilian, sport and private air vehicles are significantly contributing to the air and the noise pollution in the world, causing also

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expensive air travels. A much better solution represents the hereby disclosed and claimed BEZENTROPIC VORTEX PROPULSION SYSTEM having better fuel efficiency and therefore less polluting and less expensive. The JET PROPULSION is low efficient mainly because is blowing and exhausting in the atmosphere enormous linear kinetic energy, with little benefit, by pushing and moving the air plains by pushing them against air, instead (like the cars) against solid level road.

The vortex propulsion provides significant reduction of the needed kinetic energy. That is because (a) the kinetic energy in the vortex propulsion is of ROTARY (circular) kind instead being linear and (b) because the circular (vortex) energy could be almost entirely converted to axial trust -accelerating the air vehicle- through a cone, inside of which the rotation is performed, before leaving that special vortex cone-nozzle. All that works as follows:

Detail 1 of Fig. 9 represents a Bezentropic Air Compressor rotated by the same bezentropic turbine of Fig. 6(a) (which, for redundancy, is not shown on Fig. 9). The role of that compressor is to deliver the necessary ^{for} air the combustion chamber 4. Detail 3 there represents a carburetor. The combusted hot gases then enter the flat nozzle 5 and from there inside the spiral 6 of the vortex tube 7 through the annular aperture 8, causing propulsion by pushing the conical tube 7 through tendency for annular expansion of the vortex jet 9. That in the mean time sucks more air from aperture 10 of the vortex tube which, influenced by the vortex jet 9, also starts to circulate and pushing additionally the cone 7 of the vortex jet is increasing significantly the efficiency of the VORTEX JET PROPULSION. That efficiency depends also on the length and ^{on} the angle α of the vortex tube. The supersonic acceleration of the flat nozzle 5 helped by the spiral 6 and the annular aperture 8 causes inside the conical vortex tube 7 very high R.P.M., VORTEX (rotary) JET of enormous CIRCULAR ENERGY which, where the tube 7 is sufficiently long is almost entirely zeroed and converted to more efficient DIVERGENT VORTEX PROPULSION. That is also almost FULL conversion of the heat into said VORTEX JET AFTER PROPULSION, CAUSING LESS POLLUTION IN THE ATMOSPHERE. The low efficiency of the classic (linear) JET PROPULSION is due to exhaust of enormous linear kinetic energy for pushing ahead the air jet against a body of air instead against a solid body, like the cone 7 of the vortex propulsion.

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Bezentropic Vortex vacuum evaporation, condensation and thermochemistry

The heat is basic ingredient of the chemistry. Every chemical compound is synthesized and decomposed either by endothermic or exothermic heat. The heat is also

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main variable of any thermodynamic state of any gas or steam. It play important role in the chemical analysis, in the separation and the purification of the chemicals in the ordinary and in the fractional distillations and condensations on which are based many industrial processes. All these processes are objects of the thermochemistry. The distillation, the vacuum distillation and the condensation processes are inseparable part also of the synthesis of the, herein disclosed and claimed ACETAL FUELS.

Fig. 10(a) is expressing a VORTEX WAY for distillation designed to minimize the expenses for heat in the manufacturing of the acetal fuels whenever is needed double distillation. The same method is practical also for other chemical processes like for manufacturing ethers and alcohol for example. So far,

on Fig.10(a) device 1 represents again a bezentropic compressor rotated by a bezentropic turbine like that given on Fig. 6(a). Its purpose is to deliver pure air to the Flat Nozzle 2. There the air from the compressor is additionally accelerated into a FLAT JET; and then, delivered to VORTEX TUBE 3. There, the hot end (a) of the vortex tube deliver its hot air to boilers 4 and 4', while the cold end (b) of same vortex tube is directed to the coolers 6 and 6'. The remained kinetic energy -exhausted from boilers 4 and 4'- goes to turbine T_1 where is converted to electricity. The remained kinetic energy, of the cold air, (supplying the coolers 6 and 6') goes ^{first} to turbine T_2 where is also converted to electricity. The boilers 4 and 4' are adjusted to work at temperature of about 60°C to perform double distillation of the acetal 'fuel & water' blend (containing a lot of water when the acetals are produced from FORMALDEHYDE and alcholes, instead from the dry ACETALDEHYDE and alcholes). The so obtained acetal steam accompanied with some water steam passes through columns 5 and 5' -filled up with Rashig rings, or by broken glass bottles. The passing water vapor there condenses and returns to theirs respective boilers, while the acetal steam from boiler 5 goes to the cooler 6 where it condenses to liquid acetal fuel and then moves to the second boiler 4' to be distilled there a second time and finally condensed to liquid acetal fuel collected by the recipient 7. The vacuum of the distillation is caused by the drastic hermetic cooling of the cold air generated the cold end (b) of the vortex tube. The final product of the double distillation is collected by the recipient 7. When needed, by a similar way, can be performed also triple distilling.

Fig. 10(b) is a an VORTEX IONIC HIGH VACUUM TUBE designed for large working volumes and high efficiency; useable for any laboratory, scientific and industrial purposes.

There 1 represents a Geissler tube (shaped like the letter M) in process of evacuating the air from there; 2 represents a high frequency coil ionizing air inside tube 1 into a state of plasma. Device 3 represents a high frequency rotating magnetic field similar to that used in the induction motors, performing the rotation of said plasma, fed -through 4- by high frequency electric current for that purpose. Device 5 is a conical shaped vortex tube performing the evacuation of the plasma through its high frequency rotation and high centrifugal forces, caused by the high frequency rotating magnetic field and the vortex chamber 6.

Fig, 10(c) is an VORTEX IONIC PROPULSION SYSTEM representing a combination of devices taken from these of Fig 9 and Fig. 10(b). The main problem for having ionic propulsion is finding a way for inexpensive fast and sufficient generation of ions which is not solved to present. I remember that back (around) 1964 French colleagues from University of Paris tried to build an ionic propulsion system by using as source for ions the chemical element of Indium (In) since it is easy for ionization. The maximum THRUST which they were able to obtain was around 1 pound, as a result of which they abandoned the project. Most recently the space program of NASA is trying the XENON (Xe). However it is an expensive gas not promising commercial application for aviation purposes. I solved the problem by using as ionic fuel NASCENT HYDROGEN (a mixture of atomic hydrogen and protons) obtained from cracking the plurality of the ammonia and the ammonia compounds. For that purpose are preferred dry ammonia and ammonium nitrate since when they are cracked are obtained only nitrogen and nascent hydrogen; hence, they are the best ecological fuels (ecofuels). Said cracking is obtained at temperature of over 600°C either by pyrolysis or through electric arc. I found that in such conditions the obtained nascent hydrogen is durable for about 25 to 30 seconds which ^{is} more than necessary time for its vortex acceleration. After that time the nascent hydrogen H^+ recombines into molecular hydrogen H_2 which evolves the enormous heat of 101,000 Kals. per gram mole. Then, burning the H_2 yields additionally 67,000 cal/gr. mole and that way is obtained only preheated steam. Using said, ammonia based, ionic fuels the ionic vortex propulsion works as follows:

As before device 1 represents a bezentropic compressor blowing air in the cracking chamber 2 representing in the mean time a chamber of combustion to the obtained there nascent hydrogen.. The ionic fuel there is introduced through input 3. The combined cracking and combustion is initiated by the electric arc 4 which is disconnected once the temperature of the combustion chamber rises over 700°C . The high temperature partially ionizes also the the incoming air supporting the combustion process cracking the ammonia into nitrogen and nascent hydrogen. The so obtained plasma passes into the flat

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nozzle 5 and then in the vortex chamber 6 where it start to rotate. That rotation is further accelerated by a high frequency rotating magnetic field 7 similar to that used in the induction motors. The necessary ionic trust is obtained by the pressure exercised upon the inner surface of vortex cone 8 by the, rotating with high frequency, flow of plasma. For that purpose all parts of this ionic propulsion system touching the plasma must be made out of titanium matal.

Direct Conversion of heat into work and electricity via cells and brownian movement of the electrons

Prototypes for direct conversion of the heat into work and electricity are humans and all other living beings. That conversion is conducted at their individual muscles cells and then, integrated into macro muscular force and bio-electricity generation. All living being are therefor both biological heat engines and electric generators which are FITLY DEFYING the LAW of ENTROPY because: they all are converting the heat into work and to bioelectricity, at theirs cells, without temperature gradient. Such conversion is strictly prohibited by the law of entropy, known also as the SECOND LAW of the classic and quantum thermodynamics and known also as the LAW OF DISORDER, caused by the disordered molecular movement in the universe; especially the molecules of all gases and steams.

Contrary to that, all living beings are aggregations of cells, each of them submitted to strict order by theirs genes and DNA. That makes them bezentropic creatures for they all are exist, move and work without temperature gradient which is following the law of bezentropy. That is also because back in 1900 the Austrian physicist, LUDWIG BOLTZMANN proved mathematically, that the law of entropy is not absolute but a purely statistical law which is not at all valid for micro volumes of space.

More particularly, the cells are converting the heat into work and electricity as follows:

it has been observed that, most cells (excepting tease of the nails, hears and bonds) contain in theirs cytoplasma beside protoplasm, nucleus, and genes, also small (cell looking) particles termed MITOCHONDRIA (containing many of the cellular enzymes, especially those needed to support the lemon-acidic cycle). By recent, more precise microscopic observations and photography has been revealed also that each mitochondria contains, a very small, molecular size rotary engine having stators and rotors of made out of molecules and IONS performing eternal rotations there, by the 'to and fro' reshuffling of cells' molecules inside the cytoplasma. Namely that way is generated the work (form of rotary kinetic energy) and the bioelectricity there, which is driving our nervous system

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thus, causing to contract and relax our muscles to perform work without temperature difference (aka gradient). The heat causing said molecular reshuffling comes there from the catabolism of the blood sugar by enzymes of the mitochondria.

These small (nano size) molecular turbines are actually the engine dreamed (but missed) by the Russian physicist M. SMOLUHOWSKI who theorized them in 1915..

Contributing to the probability theory of LUDWIG BOLTZMANN, Smoluhowski proved that if we can build a molecular size engine it will work (until is broken) without temperature gradient and without input of heat, using for the purpose energy from the eternal brownian movement of the molecules (which is resupplied with energy by the sun). The discovery of nano turbines in the living cells confirmed the theory of Smoluhowski.

Excited by the works of Boltzmann and Smoluhowski, I noticed that while said nano size engines (inside our mitochondria) are of micro volumes where the law of entropy is not valid, and that all cells our hands and legs must be connected for a parallel cooperation to perform 'heat to work conversion' without temperature gradient. Only that way macro living being can perform the bezenropic work of its nano size cells. Evidently that connection and synchronization is performed by the bio electricity and our nervous system which; is good conductor of electricity.

That idea allowed me to realize that: beside macro and micro molecular bezenropy and order, there must be also electronic and ionic bezenropy since there the disordered state can be easily converted to ORDER by MAGNETIC FIELD, connecting that way, for parallel work, billions of electrons and/or ions.

Regretfully, the most simple and efficient such device would become practical only when one day are developed and commercialized the ROOM TEMPERATURE SUPER CONDUCTORS. Of course such device can be build with the existing super conductors of electricity but only for scientific demonstrations since the best (now existing) super conductors requires cooling by nitrogen which is not practical and not efficient. Anyway one such device given on **Fig. 11** and consists in the following:

part 1 there represents a magnetic core made out of silicon doped sheet metal, like the cores of the regular transformers. 2 and 3 are strong permanent magnets. I is the primary coil and II is the secondary coil of the thransformer; both of them are made out of super conducting wire. C_1 is a variable electric condenser and C_2 is a blocking condenser.

Assuming that the super conducting wire work at room temperature (or if not that it is cooled by nitrogen) the device work as follows:

As is well known the electron clouds inside all metals (including kinds of wires) comport them self like a gas and participate there in electronic kind of Brownian motion;

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repulsing each other 'to and fro' thus, like a gas, acquiring a mean free path and facing always a certain resistance when they form an electric current..

CONTRARY TO THAT, whenever the wire is super conducting the electrons meet no resistance; hence, their mean free path -inside the super conductors- become infinitely long, whenever they form a current. When in the super conductor they are not in state of current the mean free path, of the electron, become limited up to the length of the wire and their reshufflings proceed in both direction between the extremities of the super conducting wire.

In this conditions, when the super conducting coil is inserted in the field of a strong permanent magnet that field rectifies the mean free paths of the electrons into one and same direction; thus, causing an electric current, the electromotive force of which is the eternal Brownian movement of the electrons fed by heat from the air.

This new effect is actually generating electrical energy from one only reservoir of heat (the atmospheric air) and is obviously defying the law of entropy. Therefore, it creates a neww EFFECT OF MAGNETO-ELECTRIC ORDER representing a new kind of ELECTRONIC BEZENTROPY. The so generated electric energy is extracted from the resonance circuit of the secondary coil of transformer as alternative current. An optional vortex tube may serves to deliver more heat to the Brownian movements of the electrons but the used working temperature shall be no more than 100°C to keep it away from the temperature of Curie which is deteriorating the permanent magnet.

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Fig. 12 is a modification of the super conducting device of fig 11 modified to work without super conductors using for the purpose regular copper or silver wire to take advantage from the brownian movements of the electrons. For that purpose however the wire is made, by way of electrolisis, in shape of thin silver or copper band supported on teflon band where the thickness of the metallic band must be several times less than the mean free path of the electrons there in order to force them to reshuffle into a plain instead of a volume. In these conditions when a coil of such flat wire replaces the coils of the device given in fig.11 and when as in fig 12, using said flat wire, is added also the battery "B", the new device can also extract energy from the Brownian movement of the electrons and is adding that energy to the energy of the battery which increases its duration between the necessary rechargings. Since the extra electricity comes from the Brownian movements and the energy of the Brownian movement comes from the heat of the environment then: the device of FIG.12 is a new kind of heat pump pumping heat from the environment and in the mean time converting it into electricity.

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Synchronization

A condition to connect the power plant of Fig 6(a) for parallel work with other power plants is the synchronization with them both by frequency and phase. That task is performed by the device given on **Fig. 13**. It works as follows: the *synchronous motor 1* shown there must work fully independently from the rotation of the axle-tree 5 of the turbine and be synchronised with the outside alternative current. The easiest way to do that is to use the synchronous SERVO MOTOR "SM" denoted also by 1. To preserve the independence of the SM it must not be connected with the generator of the turbine nor with its axle-tree 5. The role of the synchronous motor is only to rotate gear 4 independently from 5 and to do that strictly by a frequency of 50 Hz which is equal 3,000 RPM for Europe. That frequency for the United states must be 60Hz which is equal to 3,600 RPM.

Accordingly, if the RPM of the synchronous motor is 6,000 RPM the ratio between Gear 2 and gear 3 should be 2:1, to obtain 3,000 RPM of gear 3; and if not the ratio should be changed to obtain the mandatory 3,000 RPM, for Bz. turbine working in Europe (and to 3,600 RPM for Bz turbine working in the United States). Gear 3 is made out of teflon or polyamides and contains seven (or more) photodiodes 7. There CPhD is the central photodiode. Ring 4 is again made out of teflon or polyamides and solidly fixed to the axle-tree 5. Ring 4 contains the important Light Emitting Diode (LED) 6. When switching the turbine to work first must be switched the SM and then the turbine. In the beginning of its start the turbine rotates slow and is not synchronized with gear 3. After that however it attains the necessary 3,000 RPM of gear 3 (holding the photodiodes 7); at that instance said LED activates the photo diodes 7 and that locks gear 3 with ring 4. That happens through the AMPLIFIER (amplifying the currents of the photodiodes 7) and the SOLENOID (driven by the amplifier) which control the gas valve 11 of the turbine. In these conditions whenever the turbine tends to increase or decrease its RPM the photodiodes 7 and the amplifier send additional signals (currents) to the solenoid to correct the natural gas flow INPUTTED in the turbine, performed by suitable openings or closings gas valve 11.

What I claim is: **Claim 1**

The CLEAN PROCESS OF PROCESSES invented for manufacturing of non carcinogenous, zero polluting eco fuels, derived from gas hydrates, fuel alloys and very inexpensive electricity-generated from the special BEZENTROPIC POWER PLANTS of this invention - all engineered to avoid exhausting in the atmosphere even CO₂, in order to prevent the menacing GREEN HOUSING EFFECT; where the *gas hydrates* used as chemical feedstock are prospected, mined and processed to obtain from them the necessary

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NATURAL GAS -used as secondary chemical feedstock to derive from it the eco fuels- which 'process of processes' requires inexpensive electricity, to be practical; *here for* that reason were invented also the indispensable BEZENTROPIC POWER PLANTS, all working the following way:

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using a boat, and a geostatic positioning system (GPS) an operator-geophysicist first proceeds with the development of a system of geophysical profiles, in the open see, were is supposed (from preliminary testing) to look for and discover the necessary *gas hydrates*; then, using a portable electric generator, a switch, a reel on which is wound a hose together with a cable having marks at every half meter of its length and ending with a special (powerful) spark plug and the hose ending with a small frogman's like bell, where is housed the spark plug- then, the operator stop the boat at every 100 meters or so (according to the desired geophysical precision) upon said profiles takes the coordinates of the stop with said GPS, measures the depth of the see there and then, with the help of said portable generator, the cable and the spark plug provokes one or more powerful underground thunders at the bottom of the see prompting the decomposition of the *gas hydrates (if they exists there) and liberation of the contained in them natural gas which is collected by the bell and sent to the operator through the hose of the bell; then, the operator input in his computer the so obtained data from the thunder, from the depth and form the coordinates of the thunder and then, go to another point of the same profile to repeat and record the same measurements and when repeat the same activity upon all profiles of the selected see area he gets the data for a whole geophysical prospecting map for depicting the existence or non existence of gas hydrate on the searched see bottom; then upon finding location of gas hydrate the needed natural gas extracted from them in generally follows the same technology as above described related for their geophysical prospecting but, of course, instead using said portable electric generators to cause said underwater thunders (electric explosions) upon the gas hydrates at the bottom of the see must be used the special BEZENTROPIC POWER PLANTS of this invention since the industrial exploitation of the gas hydrates requires prodigious amount of electricity and only the bezentropic power plants, described later in this claim can provide up to 3 (three) times less expensive electricity, the other requirement being large see platform, rig, hose, frogman's bell and underwater thunders, and once having them and obtaining with them the necessary natural gas, from the gas hydrates, the desired PLURALITY OF ECO FUELS is obtained the following way:*

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(a) the so obtained natural gas is directed to the combustion chamber of a bezentropic power plant and combusted there to produce electricity by an extraordinary

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heat to electricity conversion of up to 90% or more, while the generated CO₂ 'green house gas' is separated from the nitrogen (both by-produced from the combustion of the natural gas with the air) and directed to the sea water, while the nitrogen is saved to be blended with 4 to 40% hydrogen to convert the hydrogen to safety fuel for industrial transportation and home purposes which ^{H₂ is} otherwise extremely explosive and dangerous; for which the necessary hydrogen, for the fuel blend, is obtained via electrolysis of the water with the inexpensive electricity of the bezentropic power plant;

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(b) using the so obtained inexpensive hydrogen also for manufacturing of calcium hydride as convenient way for storage of hydrogen in the solid state form, of fuel, ~~an then~~ (when needed) the hydrogen is conveniently and safely liberated by hydrolysis with water which method is known but almost never practiced on account of today's expensive electricity and hydrogen;

(c) using the same as above by-produced nitrogen and inexpensive hydrogen to produce from them the *IONIC FUELS* of this invention consisting of ammonia and ammonia compounds, preferably the *ammonia and the nitrogen nitrate*, which through pyrolysis of over 600°C decompose and liberate plasma of nascent hydrogen and nitrogen, having about 30 second duration of time until the ions of the plasma recombine to molecular gases, which is more than the necessary time to use the plasma for ionic propulsion; and where to make that *IONIC FUEL less expensive than the present JET FUELS, the classic methods for manufacturing the ammonia and its derivative is changed by introducing there the bezentropic power plants to supply them with less expensive hydrogen as that is above described;*

(d) the novel manufacturing ^{of} hydrogen fuel, from H₂S and CS₂ containing gas hydrates and water, via bezentropic power plants, the modification consisting in replacement of the combustion chamber, of the bz. turbine, by classic type steam generator, allowing *FUIDIZED BED COMBUSTION in the presence of limestone* converting the polluting sulfur to the neutral and valuable gypsum, thus eliminating in full the pollution from the H₂S and the CS₂, which in the meantime convert the bezentropic turbine from gas and steam turbine to entirely steam turbine and elimination of its compressors as that is described further in this claim;

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(e) the no carcinogens and no pollutants containing (except the CO₂) *ACETAL FUELS* — *plurality* needed for ~~one~~ intermediary period of time, until the hydrogen and the electric cars, trucks and agricultural tractors, replace all present transportation and agricultural vehicles, ^{all} using (the present days) polluting hydrocarbon fuels, numbering around one billion now in the world and impossible to replace them at once by

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any high technology magician; said acetal fuels being produced again from natural gas derived preferably from gas hydrate and from the *FUEL ALLOYS* of my American patents No 4,110,082 allowing gaseous and liquid hydrocarbons when submitted to 80°C to 100°C ACIDOLYSIS as follows:

the derivation of the acetal fuels is achieved by converting the natural gas or other hydrocarbons, into them, through continuous PARTIAL (selective) CATALYTIC REDOX (oxidation-reduction) REACTION, conducted in temperature controlled tubular chemical reactors, in the condition of fluidized bed partial oxidation with insufficient air or oxygen at a temperature of $450^{\circ}\text{C} \pm 20^{\circ}\text{C}$, at atmospheric pressure to 40 atmospheres and in the presence of a catalyst consisting of electrolytic copper in shape of spiral coils or granules which yields initially an intermediary master blend of roughly equal quantities of aldehydes and alcohols blended with insignificant amounts of ketons (mainly acetone) where the aldehydes consist mainly of formaldehyde with lesser amount of acetaldehyde and the alcohols represented mainly by methanol and lesser quantity of ethanol; after which said master blend is transferred into a continuous tubular cooler to cool it down from 50°C to 60°C which is condensing the alcohol steam to liquid alcohols while in the mean time the master blend is sprinkled with 10 to 15% water to absorb the aldehyde constituent of the blend and mix it with the alcohols after which that liquid mixture is passed in to another continuous tubular ^{reactor} where passing through another catalyst - consisting of strongly acidic ion exchange resin or zeolites doped with CaCl_2 is converted to a bouquet of acetal fuels of very high octane number, ranging from 123 to 150 O.N., which, after distilling that fuel blend from said water, there is no need to separate the different acetal constituents because, said bouquet is better performing as fuel; for transportation, for heating purposes and as solvent for paints and has a much more agreeable smell than any other liquid fuel; and such fuel has no carcinogens nor other polluting agents, the only inconvenience with the method being that it is compounding half of the obtained aldehydes with all of the alcohols, which inconvenience however is eliminated by passing the extra aldehydes through the synthetic zeolite ZM-5, a catalyst converting the extra aldehydes into light, non carcinogens containing, aviation type of gasoline or, eliminating said inconvenience by reacting the extra aldehydes with methanol produced from same natural gas via the known process of GEORGE PATARD using for the purpose the zinc oxide as catalyst;

(f) manufacturing predominantly gaseous hydrocarbon blend, from my fuel alloys described in my aforesaid American patent, to produce from them the acetal fuels since beside the methane they are yielding also higher hydrocarbon gases, diversifying the

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acetal fuels for more aroma, doing that by increasing the MANGANESE TRITA CARBIDE of the fuel alloys up to 80% the rest of that incentive being as above described;

(g) the pivotal for this 'PROCESS OF PROCESSES' Bezentropic Power Plant of the invention without which it is impossible because only this way is possible to generate the much less expensive electricity needed to afford the ECONOMICAL FEASIBILITY of the invention and to eliminate the air pollution, once for ever, by

DESINING THE PLURALITY of the BEZENTROPIC POWER PLANTS as follows:

g-1; first should be noticed that it is wrong to believe that the hydraulic power plant are strictly hydraulic because, the energy causing the waterfalls by elevation of the water vapor -evaporated from the oceans and the crust- up to the clouds, causing the rain, is HEAT ENERGY that way converted to POTENTIAL ENERGY of the water, feeding the waterfalls to drive the hydraulic power plants; hence it is obvious that the initial energy of the power plant is the latent heat of the vaporization of the water, _____

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_____ telling rightfully that the hydraulic power plants are actually HYDRO-THERMAL (THERMO-HYDRAULIC) POWER PLANT hence, that invokes the question: why then all _____ THERMAL POWER PLANTS are strictly

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submitted to the SECOND LAW OF THE THERMODYNAMICS (termed also LAW OF ENTROPY and LAW OF THE DISORDER IN THE UNIVERS; stemming from the disordered molecular movements) limiting the theirs efficiency down to about 30%, while the THERMO

HYDRAULIC TURBINES disobey and flatly defy the law of the entropy and attain an efficiency going up to 94%?; hence, isn't all that^a kind of DOUBLE STANDARDS in the behavioral of the heat because, the full cycle of the thermo hydrauwlic turbines is also

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including the heat; but, they stil obey to a DIFFERENT LAW OF THE HEAT, which, when I discovered it, named it the LAW OF ORDER IN THE UNIVERSE and also the LAW OF BEZENTROPY (from where is derived the notion BEZENTROPIC TURBINES) which allowed

me to see and realize the big difference between the 'heat to work conversion' carried trough VOLUME EXPANSION of a gas, or steam, and the 'direct heat to potential energy conversion' trough SPONTANEOUS (self) VAPOR ELEVATION up to the clouds representing an

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ORDERED, not disordered, CREATION OF POTENTIAL ENERGY, which clouds then, following the equally SPONTANEOUS CONDENSATION of the vapor into rain creates after that, the waterfalls converting (again in ordered manner) THE POTENTIAL ENERGY of the so obtained

water, then, converted to LINEAR KINETIC ENERGY, and then, to ROTARY KINETIC ENERGY, ROTATING THE WATER TURBINES THUS, PERFORMING WORK, BY AN EFFICIENCY OF UP TO 94% or more; all that representing a SERIES of EVENTS OF ORDER caused by the following

LAWS keeping the order of the series: (1) latent heat of vaporization inflating the liquid

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water to vapor which is less weighting than the air, (2) the law of ARCHIMEDES elevating the vapor to the clouds and no more because due to the volume contraction of the vapor resulting from the creation of potential energy during the elevation, the weight of the vapor equalizes with that of the air); (3) the law of condensation involved at the level of the clouds, converting the potential energy of the clouds to potential energy of liquid phase (rain, waterfalls) (4) the law of spontaneous conversion of the potential energy of the water (at the input of the waterfall) entirely into linear kinetic energy (at the bottom of the waterfall) and (5) the final conversion of the so obtained linear kinetic energy into rotary kinetic energy performed by the rotor of said THERMO-HYDRAULIC TURBINE, when non of the above laws obey the law of entropy, regardless that the above laws (1), (2), and (3) are concerned with heat and vapor which are thermodynamic and not mechanical phenomena, EVIDENCING THAT THE LAW OF THE ENTROPY IS NOT CAPABLE TO CONTROL ALL PHENOMENA OF THE HEAT AND THAT, IN THIS PARTICULAR CASE, THE HEAT ENERGY OF THE VAPOR FOLLOWS A SERIES OF 'LAWS OF ORDER' as part of my more universal LAW OF BEZENTROPY where, like in the above series THE COMMON GROUND for all kind of energies involved ~~involved~~ in the BEZENTROPY is that they all are possessing NATURAL TOTAL DIFFERENTIALS, while the HEAT ENERGY submitted to the LAW OF ENTROPY has always an ARTIFICIAL TOTAL DIFFERENTIAL derived from a PARTIAL DIFFERENTIAL OF THE HEAT through an INTEGRATING DIVISOR equal to the 'absolute value' of the temperature of KELVIN "T" YELDING THE REDUCED QUANTITY OF HEAT "B" OF CLAUSIOUS and to the LAW OF ENTROPY when to the absolute value of "T" is attached its physical dimension of [temperature] and all that gave me a hint that following the so defined order of the bezentropy, eventually one may build another, more compact power plant than those using MOTHER NATURE'S waterfalls, not needing anymore her clouds and mountains to create the waterfalls; and still having the efficiency of the 'thermo hydraulic power plants' and even more than that efficiency, which I solved the following way:

g-2; I followed the above stated differential requirement of the law of bezentropy since that is needed TO INTEGRATE AND CONVERT THE HEAT ENERGY OF THE INDIVIDUAL GAS OR STEAM MOLECULES, INTO WORK, WITHOUT RECURRING TO SAID "INTEGRATING DIVISOR" SINCE NAMELY THAT DIVISOR IS THE MAJOR HANDICAP OF THE CLASSIC THERMODYNAMICS, LIMITING THE EFFICIENCY OF THE HEAT TO WORK CONVERSION DOWN TO A MISERABLE PERCENTAGE; thus, guided by the bezentropy I replaced the water vapor and the water with FREON STEAM and FREON as better working body; and then, since all freons have 'latent heat of vaporization' equal to about 30 to 35 Kcal/kg instead of about 540 Kcal/kg for the water, one does not need clouds and mountain to create a FREONFALL.

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but, only a low temperature BOILER for FREON boiling and about 100 meters long vertical tube, for elevation of the freon stem, made from polyethylene, because the 'latent heat of vaporization' of the freon is about 15 times smaller than the 540 Kcal/kg of the water hence, 100 meters elevation would be sufficient to convert all of its latent heat of vaporization to potential energy and due to such heat exhaust would cause imminent condensation creating a FREONFALL of 100 meters handled by another polyethylene made tube feeding -in a closed circuit with the boiler- a hydraulic turbine allowing efficiency (like all good hydraulic turbines) of 94%, where the rest of such turbine designated for freonfall, is essentially same as that of the existing hydraulic power plants and need no more comments except that: such freon power plant may work even without fuel since the the freon boils at -30°C , yielding a lot of pressure at room temperature and therefore, could use as fuel the atmospheric air and also cooling by cold water sprinkling to further facilitate the condensation velocity of the freon;

g-3; the next member of the plurality of the BEZENTROPIC POWER PLANTS deals with the direct conversion of the heat into linear kinetic energy and after that to rotary kinetic energy then, to work and electricity, following the logic provided from my LAW OF ORDER in the universe working, in this particular case, through the first and the second laws of BERNOULLI, like the well known NOZZLE of LAVAL, using my FLAT NOZZLES, BEZENTROPIC ROTORS and TURBINES, all objects of this invention, invented when in the beginning I noticed that the nozzle of Laval flatly DISOBEYS and is DEFYING the LAW OF the ENTROPY because: it converts the ENTALPY (the heat content of all gases and steam identified as bezentropic form of heat energy because, as required (for that) its differential is a NATURAL TOTAL DIFFERENTIAL) directly into linear kinetic energy, by an efficiency of 99%, which is strictly prohibited by the second laws of the thermodynamics (aka law of entropy) such efficiency being allowed only by my LAW OF ORDER IN THE UNIVERSE; and then, when analyzed that situation I found that the STRONGLY DISORDERED (by the heat) VECTORS of the IMPULSES, of the gas and steam molecules, when passing through the nozzle of Laval becomes spontaneously converted to single INTEGRAL of massive impulse in the form of a macro 'vector-jet', capable to perform work (like jet of water in a water turbines) yielded from the difference of the kinetic energy of the jet before and after hitting ^{the} water turbine's blades, which

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prompted me to study WHY that excellent feature of the NOZZLE of Laval and the ENTALPY (which as said is a bezentropic form of energy) still cannot ~~eliminate~~ the miserable efficiency of any classic gas or steam turbine and discovered that the OBSTACLE FOR THAT ARE THE THOUSANDS TURBINE BLADES, FASTENED UPON THE STATOR AND THE ROTOR OF ANY CLASSIC TURBINE, which are destroying the bezentropic ORDER of turnines' jet(s) converting the order back in state of molecular disordered movements which is downgrading the ENTALPY, by converting its total differential to PARTIAL DIFFERENTIAL, THUS, REQUIRING INTEGRATING DIVISOR and its REDUCED QUANTITY OF THE HEAT "B" (introduced by Clausius), to integrate and convert to work the energy of all molecules of the working body, telling that all classic turbines as well as all classic reciprocating engines are actually devices for integrating and converting to work ONLY PARTIAL DIFFERENTIALS, AND NOT DEVICES WORKING WITH NATURAL TOTAL DIFFERENTIALS OF THE HEATH SUCH AS THE 'ENTALPY', THE 'LATENT HEAT OF VAPORISATION' and others capable to be integrated and converted to work by first fully and directly converting them to potential and kinetic energy, avoiding the enormous exhaust of heat in the atmosphere without benefit, AS MANDATED BY THE ENTROPY, which misery I defeated, by my herein claimed BEZENTROPIC STEAM TURBINE, BY CONSERVING THE TOTAL DIFFERENTIAL STATUS of the 'ENTALPY' (that is the total heat content of the steam or gas' working body) until the heat is (practically) fully converted to work, mechanically achieved as follows:

realizing that the trouble causing the low efficiency of the *classic Steam Turbines* are the thousand blades fasten on theirs rotors and stators, not allowing the steam jets to work normally, as in a hydraulic turbine, but, destroying jet(s)' order by them and converting the ENTALPY'S status to low quality ENERGY OF PARTIAL DIFFERENTIALS which is the way for very poor 'heat to work' conversion since is switching the ENTALPY from its normal way of BEZENTROPIC CONVERSION to the way of the miserable ENTROPY) I invented the herein claimed FIRST, IN THE WORLD, TURBINE WITHOUT TURBINE BLADES and named it rightfully BEZENTROPIC TURBINE having a cylindrical stator NOT HAVING EVEN A SINGLE TURBINE BLADE, housing a bladeless rotor and 2 opposing variable flat convergent-divergent nozzles, fastened to the outside periphery of the stator to feed the rotor with a flat, diverging Jet of Steam, which (like the round nozzle of Laval) are accelerating the jets to supersonic velocity through the FIRST and the SECOND LAWS of BERNOULLI, blowing jets' energy inside two opposing EVOLVENT SPIRAL CANALS of the bezentropic rotor to rotate it, for which the rotor is designed like a strong reel on which are coiled and welded 2 large sheet metal bands, making said evolvent shaped spiral

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canals, the rotor-reel being suspended on a well fastened axle-tree having 2 bearings helping to rotate it inside the stator, which reel and stator have 2 or more exhaust apertures on both sides ^{covers} of the reel and the stator, placed around the heat insulated bearings of the rotor, from where the exhausted working body is outputted; the same turbine having also a boiler to generate the necessary steam, having also an RPM regulator to regulate the flow of the steam, and also temperature and pressure sensors, a generator of electricity and all other instruments used normally by a power plant, where can be used 1, 2 or more flat nozzles and when the diameter of the reel is large, more than 2 spiral canals, all causing the gas or steam ^{to work} turbine like the highly efficient hydraulic turbines — also defeating the law of the entropy;

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g-4 is further improvement of the Bezentropic Steam Turbine turned from steam to mixed GAS AND STEAM BEZENTRPPIC TURBINE aiming to eliminate the over sized expensive and not sufficiently efficient tubular STEAM GENERATOR and replace it with special combustion chamber, the rest of the construction using the same as above variable flat nozzle(s) of 'convegent-divergent' construction involving the first and the second laws of Bernoulli to perform the acceleration of the mixed 'gas + steam' jet(s) to supersonic velocities, since the task of the invention is again to obtain better efficiency by deriving work from heat ^{but} not through volume expansion causing drastic temperature difference of the working body following the law of entropy submitting the efficiency to the limit dictated by the cycle of Carnot and equal to $(T_2 - T_1)/T_2 = \eta$, (mandatory for all classic turbines and reciprocating engines) ~~since~~ the essence of this invention is TO DEFEAT THE BLUNDERS OF THE CLASSIC THERMODYNAMICS and create conditions for the bezentropic turbines to work like the hydraulic turbines which (as above averred) ARE ALSO HEAT TURBINES (since the waterfalls which they use are created by the latent heat of vaporization, elevating the water to the clouds and to the tops of the mountains); hence, INSTEAD OF DERIVING WORK FROM THE INEFFICIENT 'VOLUME EXPANSION METHOD' ARE DERIVING THE WORK FROM ^{the} 'VELOCITY DIFFERENCE' between the inputted and outputted jet(s) in the turbine, creating much larger difference between the kinetic energies of the inputted and the outputted jet(s) equal to

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$$m/2(W_1^2 - W_2^2) = \eta$$

where m = mass of the jet per second and W_1 and W_2 = velocitties of the inputted and the outputted jet(s) respectively, from where is clear that the big efficiency advantage from the Bezentropic Heat Turbines (compared with the Classic Heat Turbines and with the reciprocating engines) is same as that of the efficiency advantage gained from the Hydraulic Turbines and DUE TO THE VERY MATERIAL FACT THAT WHILE THE VELOCITIES OF

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THE JET(S) IN THE EFFICIENCY FORMULA OF THE BEZENTROPIC AND OF THE HYDRAULIC TURBINES IS ELEVATED ON SECOND POWER (W^2) that of the temperature $T = 273 + t^{\circ}\text{C}$ (figuring in said efficiency barrier of all classic heat engines and turbines) is not elevated on power; and on that is due theirs low efficiencies; the other improvements of the novel 'gas + steam' system of Bezentropic Turbine being: a two stage Bezentropic Compressor providing the necessary air to the combustion chamber of the turbine; such compressors having the advantage that are providing *DYNAMIC AIR PRESSURE* instead of *STATIC PRESSURE*, the essence of such choice being that it avoids the thermal losses from increased temperature, caused by the static pressure when the air is compressed instead of being only accelerated; said novelty being performed again by abandoning the turbine blades, the stator and the rotor, of the classic turbo compressors and replacing them by bladeless rotors and stators like these of the above disclosed BEZENTROPIC STEAM TURBINE; after which through a variable valve handling the natural gas fuel the air blowing from the second stage of the bezentropic compressor is mixed with the natural gas and transferred by a classic nozzle of Laval to the long water cooled tubular combustion chamber ending with another such nozzle where the hot burned gases are sprinkled with water to generate steam without bothering the combustion process and the so obtained gas and preheated water steam is directed to a distributing pipe, feeding the flat, variable and convergen-divergent nozzl(s) of the turbine, with hot gas + steam mixture passing through the nozzle is accelerated to supersonic jet and in the mean time rectifys the DISORDERED MOLECULAR MOVEMENT TO ORDERED MOLECULAR JET; which converts the ENTALPY of the working body, directly and entirely, to linear kinetic energy; and then, blowing in the spirally coiled canals of the bezentropic rotor, of the turbine, where said linear kinetic energy is converted to ROTARY KINETIC ENERGY, WITHOUT DISTURBING THE BEFORE CREATED MOLECULAR ORDER OF THE WORKING BODY (gas = steam) and that rotary energy tantamount to work, which is converted to electricity through an electric generator connected with the turbine; which is synchronized by frequency and phase with other power plants to work with them in paralel; and

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g-5 another best way of the plurality for clean environment is the modification of the bezentropic steam turbine to work by closed circuit using for working body special non polluting FREON STEAM the boiler of which is heated by my MODYFIED VORTEX TUBE, playing the role of hight temperature heat pump and using only flat convergen-divergent nozzles thus, allowing the turbine to extract heat and work energy from the Bownian molecular movement of the atmospheric air, without violating the first and the second laws of the classic thermodynamics, since that way it is working following the independant

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LAW OF ORDER IN THE UNIVERSE (the bezentropy), where said modifications have the following background:

near the end of the 19 century Thompson introduced the reverse thermodynamic cycles and showed that, by using as working body refrigerants for them, one can steal heat from the air, such devices now being commonly known as HEAT PUMPS and used for air conditioned room heating; and that immediately led to the (soon frustrated) idea of building the so named 'perpetum mobile of the second kind' which is NOT CONTRADICTING THE FIRST LAW (of energy conservation) of the thermodynamics since the heat pumps are not creating but, simply stealing heat energy from the environment, the more particular idea being to connect a 'heat pump' with a good engine to rotate the pump in order to extract heat from the air and use that heat to power the engine; however, it was soon proven that such combination is not possible because, it is prohibited by the second laws of the thermodynamics (THE ENTROPY) and the best MATHEMATICAL PROVE for that is the following FORMULA 86 concerned with the EFFICIENCY η_{pm} of such 'perpetum mobile' obtained by stealing heat from the air through a best possible heat pump, having efficiency η_h , based on the reverse thermodynamic cycle of Carnot, then, using that heat to drive the best imaginable Engine -of Carnot- theoretically having the highest efficiency η_c , or

$$86. \eta_{pm} = \eta_h \cdot \eta_c = (T_2 - T_1)/T_2 \cdot T_2/(T_2 - T_1) = 1; \text{ or, } \eta_h = 1/\eta_c$$

which formula is showing that nothing is gained this way because of the mutual reciprocity between η_h and η_c where a high efficiency of the heat pump is killing the efficiency of the heat engine and the high efficiency of the heat engine is killing the efficiency of the heat pump; however, when I discovered the law of the Bezentropy I soon realized that the situation of formula 86 ^{is} no more valid since the efficiency of the BEZENTROPIC TURBINE (replacing the classic turbines) and of the VORTEX TUBE (replacing the heat pump) are ^{that} independent from each other, not submitted to the GEDANKEN cycle and engine of Carnot, and follow the LAW OF ORDER (the bezentropy) OF THE UNIVERSE on account of which formula 86 is no more valid and that ~~allows~~ ^{allows} extraction of work and electricity from one only reservoir of heat-theoretically possible (and practically very realistic) when for working body is used a suitable FREON STEAM driving the BEZENTROPIC TURBINE, generating ^{WORK} from heat captured from the air through my improved BEZENTROPIC VORTEX TUBE and ^{its} flat convergent-divergent nozzle of this invention as follows:

it is known that the VORTEX TUBE (invented originally by the French physicist George Ranque) and the NOZZLE OF LAVAL are known since 1927 and 1885 respectively but, no one to present was able to see that they are 'bezentropic devices', simply because the very law of the bezentropy was unknown before; I discovered it and then on that

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ground rediscovered them as bezentropic devices and modified them for the purpose of this invention. ~~for which~~ I modified said vortex tube by changing its round chamber to spiral chamber, at the input of which I fastened a flat convergent-divergent nozzle to feed the chamber with ² flat jet of air at supersonic velocity, which air is supplied to the nozzle by a bezentropic compressor, which, for small and medium size cryogenic turbines, (preferably) should be of elliptic type; where after such major improvements the vortex tube becomes capable to handle the immense heating and the cooling task of extraction heat, work and electricity through the claimed cryogenic bezentropic turbine g-4 of this claim, using FREON STEAM as working body (obtained from the now existing non pollutant freons) 2nd works as follows:

the compressor (either turbo or of elliptic kind) has common axle-tree with the cryogenic turbine and to start rotate them is used a starter (which could be either an electric motor or gasoline engine) where the starter is rotating them until the freon boiler starts to generate sufficient freon steam, where for the boiling is used the separate open air cycle, by the wortex tube, starting with a tubular input incerted into a transparent and coaxial (much larger) tube, the lower half of which is aluminized into a mirror (so to enable a not mandatory option) to preheat, by sun light, the atmospheric air (passing through the inner tube) whenever there is sun; and that air then passes, and circulate, in the provided annular canal-envelop around the compressor, from where it becomes additionally preheated; then, that air enters the compressor where is compressed to about 5 to 10 atmospheres and enters the flat nozzle of the modified vortex tube where is accelerated to supersonic velocity; ^{then} enters the spiral chamber of that tube where it starts enormous rotations, which, at the inner annular output of the spiral camber, attain over one million RPM (revolutions per minute); ^{then} that tornado enters the vortex tube directed toward the hot end of the tube, advancing in that direction (under the influence of said enormous RPM) as a tubular rotating jet, but, when that ^{hot} jet arrives at the end of the vortex tube meet there a conical valve, regulated to pass only a part of the tornado, while the rest of it is forced to-simultaneously-reducing the diameter of its rotation and reversing the direction of its propagation; ^{then}, continuing its propagation as an inner rotating jet (rotating and advancing inside the opposing tubular shaped tornado), directed toward the cold, divergent shaped end of the vortex tube, where it is exhausted as very cold jet; and what makes that inner jet (of air) very cold at the exhaust is: the almost complete transfer of its (originally enormous) rotary (circular) kinetic energy to the hot opposing tubular get (enveloping the inner jet) to make the opposing enveloping jet more and more hot when it advances to be exhausted (trough said conical valve) at the hot end of the vortex tube;

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thus, its hot end attains temperature of 130°C and more while its cold end go down to -45°C and lower, which then is used by this invention as follows:

the hot end of the vortex tube is used to generate the needed preheated freon steam for which the hot air passes trough the air serpentine of the freon boiler, transfers its heat to the contained there liquid freon and then leaves the boiler and go to the flat convergent-divergent nozzle of a small air driven bezentropic turbine ^{releaser and} to convert its remained kinetic energy to electricity, ^{done} by a dynamo of said small turbine, ^{that} the electricity go to recharge a recharging battery and the air (having no more useful energy) is exhausted in the atmosphere at a temperature below the ambient temperature of the atmospheric air, while the cold air coming from the cold end of the vortex tube is first directed to another small bezentropic turbine and dinamo, similar to the above one, to collect its remained kinetic energy, on account of which the cold air becomes even more cold and after that it is sent to a cooler, fastened to the output of the MAIN FREON STEAM BEZENTROPIC TURBINE, TO COOL THE REMAINED STEAM THERE TO LIQUID FREON AFTER WHICH THE COLD AIR IS ALSO OUTPUTTED TO THE ATMOSPHERE, WHILE THE MAIN TURBINE, WHICH IS DRIVING THE BEZENTROPIC COMPRESSOR-AND IS GENERATING THE MAIN PART OF THE ELECTRICITY- ^{2nd} USES CLOSED FREON CIRCUIT WORKS AS FOLLOES: said preheded freon steam of the boiler first passes through a tubular sunlight collector -similar to one already described- to get further preheated and then to the 'flat convergent-divergent nozzle' (like that one already described) which accelerates the freon steam into a flat supersonic jet blowing inside the spiral canals of ~~the rotor of that~~ a bezentropic turbine-of same construction as the already described water steam driven turbine- where the freon steam converts its entalpy to work and electricity -using the main generator of this power plant; after which the remained-used and exhausted-steam passes to the condenser of the turbine where is back converted to liquid freon and pumped back to the boiled, ready to start a new working cycle; and for more power the same boiler may additionally be heated by fuel, especially during night hours; and for winter time the working body should be winter freon having a lower boiling point than the summer freon; and

g-6 is another important member of the bezentropic plurality of turbines and vortex tubes helping the effort for crystal clear air by replacing the inefficient and polluting JET PROPULSION SYSTEM with the more efficient and ZERO POLLUTING WORTEX PROPULSION SYSTEM which is not emitting any carcinogens, while ~~all~~ present jet propulsion system use fuels of hydrocarbons, containing roughly 45% cyclic hydrocarbons, all of which are dangerous CARCINOGENS and that JETS PROPULSION is inefficient because, to

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accelerate the vehicle it must exhaust in the atmosphere a lot of linear kinetic energy, which is not available to perform other useful work; hence, differently from that low energy efficient propulsion system, I designed the vortex propulsion exhausting very little linear kinetic energy because: it is using mostly circular (rotary) energy and also non polluting fuel as follows:

(1) the preferable non polluting fuel is nascent hydrogen -which in the mean time is ⁰⁶⁻⁰⁶⁻⁰³ *V. Jure* IONIC FUEL- derived 'IN SITU' by cracking ammonia or ammonium nitrate, in electric arc, or by thermal cracking, supplying that nascent hydrogen to 2 combustion chambers: one of them belonging to the BEZENTROPIC TURBINE -rotating a bezentropic compressor- and the other belonging to a very large CONICAL VORTEX PROPULSION TUBE of special construction, replacing the jet propulsion, where said compressor is needed to supply with air the intermediary -not conical- vortex tube (like that one described in g-5) generating HOT AIR for both combustion chambers, where the hot air ^{is} coming from the HOT END of the vortex tube- while the COLD END -of same intermediary ^{vortex} tube- is used TO COOL DOWN both the cracking chamber and said 2 combustion chambers, all working as follows: ⁰⁶⁻⁰⁶⁻⁰³ *V. Jure*

(2) the turbine, its compressor and the dynamo -producing the electricity needed for the arc cracking chamber, -cracking the ammonia ^{into} nascent hydrogen fuel- are all serviced by a common axle-tree- and put into action by a starting motor; consequently, the bezentropic turbo compressor starts blowing air in the flat nozzle of the bezentropic vortex tube, where the air ^{there} is accelerated ^{into} a flat JET of supersonic velocity, which enters the spiral chamber of the vortex tube and the jet there starts rotating by enormous RPM; then, it enters the tube where -due to the vortex flow regulating valve- are generated two opposing, HOT and COLD, VORTEX STREAMS OF AIR, after which the hot air is directed, simultaneously (through individual air conducting tubes), to the combustion chamber of the turbine and of the combustion chamber of the (funnel like) conical tube of the vortex propulsion, where the nascent hydrogen fuel -for both combustion chambers- is coming from the common arc cracking chamber; and that way the turbine starts to work on its own, disconnecting its starter, while the other combustion chamber blows the working body (the burning nascent hydrogen) in the flat nozzle leading to the spiral chamber, of the funnel shaped vortex propulsion tube, where its million per second rotations create enormous rotary (vortex) energy which, tending a radial expansion, pushes the funnel by axial force -resulting from the vector decomposition of the centrifugal force of the rotation- where the funnel is made sufficiently long, to use, for beneficial propulsion, practically all vortex (rotary) energy of the working body, and exhausting ^{is} by the exhausted working body- only a minimum of linear kinetic energy because, the main energy of the ⁰⁶⁻⁰⁶⁻⁰³ *V. Jure*

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working body is the vortex energy and because the system need heat protection, the 2 combustion chambers and the arc cracking chamber are cooled by cold air coming from the cold end of the same vortex tube; the other advantage for the energy efficiency of the vortex propulsion being the removal of the sonic barrier of the propulsion by sucking and accelerating all air in front of the propulsion by the same funnel like tube of the vortex propulsion; EVIDENTLY, because the nascent hydrogen is actually an IONIC FUEL (before the needed 30 seconds for its back recombination to molecular hydrogen) the RPM of the vortex rotation can be further increased by supplemental ^{vortex} acceleration through a rotating electromagnetic field, SAME LIKE THAT EXISTING IN THE 3 PHASES INDUCTION MOTORS BUT, OF MUCH HIGHER RPM, the electromagnetic stator of which should be fastened around the outside surface of the funnel next to its spinal chamber, where in these condition the "rotor" of that stator would be said IONIC FUEL;

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g-7 moreover, because the phenomenon of the bezentropy includes also the BROWNIAN MOVEMENTS of the ELECTRONS inside the conductors [natural, as well as synthetic (plastic) metals] and especially the SUPER CONDUCTORS, a super conducting device for extracting free energy from the Brownian movement of the electrons would equally work as follows: to the magnetic core of a transformer of alternative current is added a strong ^{-made-} of neodymium (Nd) alloy- permanent magnet where the first and the second coils of the transformer are made out of room temperature super conducting wire - presently of super conductor cooled by liquid nitrogen- where the first coil is short circuited and to the second is bridged by a variable condenser, to obtain there a resonant circuit, where in such conditions the magnetic field restricts the Brownian movements of the electrons -forcing them to vibrate into one only direction- and that creates a direct current modulated by the alternative current generated by the 'resonant circuit' of the second coil; hence, in this particular conditions, it become possible to extract alternative current caused by the concurrent actions of the Brownian motions of the electrons and said magnetic field because: the first coil is continuously resupplying the resonant circuit with energy needed to support the vibration; and in addition to that such energy generated by the Brownian motion of the electrons in permanent magnetic field can be derived by the same transformer having a single insulated coil of silver or copper in condition that the coil is connected with a rechargeable battery (to compensate the resistance of the coil stopping the current of the Brownian motion) and when the polarity of that battery follows the polarity of the current obtained from the Brownian motion, the energy efficiency of the battery becomes increased due to the current from the Brownian motion of the electrons which is added to that of the battery,

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